

Repeater: 27.3

**Table 29-1—Delays for network media segments Model 1**

Media type	Maximum number of PHYs per segment	Maximum segment length (m)	Maximum medium round-trip delay per segment (BT)
Balanced cable Link Segment 100BASE-T	2	100	114
Fiber Link Segment	2	412	412

**29.1.2 Repeater usage**

Repeaters are the means used to connect segments of a network medium together into a single collision domain. Different physical signaling systems (e.g., 100BASE-T4, 100BASE-TX, 100BASE-FX) can be joined into a common collision domain using repeaters. Bridges can also be used to connect different signaling systems; however, if a bridge is so used, each system connected to the bridge will be a separate collision domain.

Two types of repeaters are defined for 100BASE-T (see clause 27). Class I repeaters are principally used to connect unlike physical signaling systems and have internal delays such that only one Class I repeater can reside within a single collision domain when maximum cable lengths are used (see figure 29-4). Class II repeaters typically provide ports for only one physical signaling system type (e.g., 100BASE-TX but not 100BASE-T4) and have smaller internal delays so that two such repeaters may reside within a given collision domain when maximum cable lengths are used (see figure 29-6). Cable length can be sacrificed to add additional repeaters in a collision domain (see 29.3).

**29.2 Transmission System Model 1**

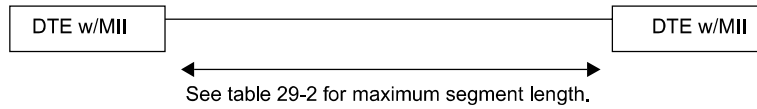
The following network topology constraints apply to networks using Transmission System Model 1.

- a) All balanced cable (copper) segments less than or equal to 100 m each.
- b) Fiber segments less than or equal to 412 m each.
- c) MII cables for 100BASE-T shall not exceed 0.5 m each. When evaluating system topology, MII cable delays need not be accounted for separately. Delays attributable to the MII are incorporated into DTE and repeater component delays.

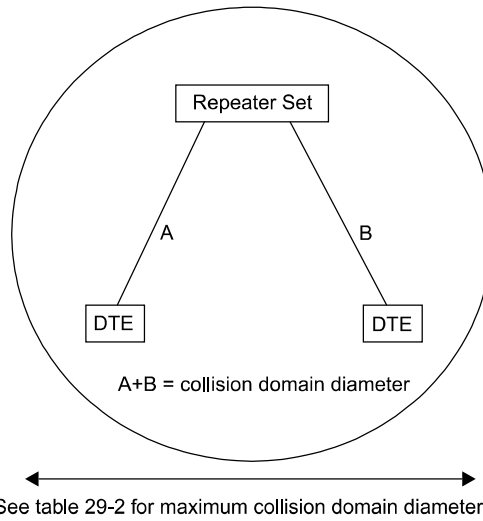
**29.3 Transmission System Model 2**

The physical size and number of topological elements in a 100BASE-T network is limited primarily by round-trip collision delay. A network configuration must be validated against collision delay using a network model. Since there are a limited number of topology models for any 100BASE-T collision domain, the modeling process is quite straightforward and can easily be done either manually or with a spreadsheet.

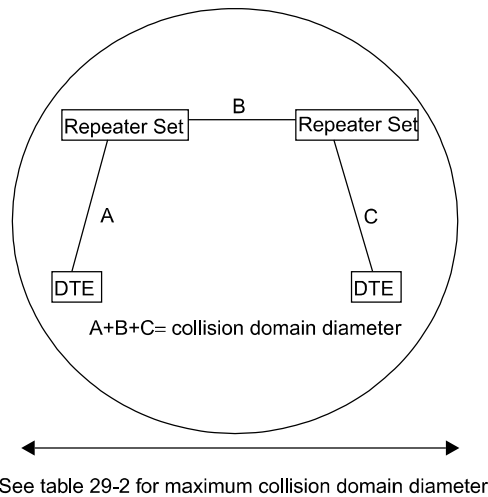
The model proposed here is derived from the one presented in 13.4. Modifications have been made to accommodate adjustments for DTE, repeater, and cable speeds.



**Figure 29-3—Model 1: Two DTEs, no repeater**



**Figure 29-4—Model 1: Single repeater**



**Figure 29-5—System Model 1: Two Class II repeaters**

**Table 29-2—Maximum Model 1 collision domain diameter<sup>a</sup>**

Model	Balanced cable (copper)	Fiber	Balanced cable & fiber (T4 and FX)	Balanced cable & fiber (TX and FX)
DTE-DTE (see figure 29-3)	100	412	na	na
One Class I repeater (see figure 29-4)	200	272	231 <sup>b</sup>	260.8 <sup>b</sup>
One Class II repeater (see figure 29-4)	200	320	304 <sup>b,c</sup>	308.8 <sup>b</sup>
Two Class II repeaters (see figure 29-5)	205	228	236.3 <sup>d,c</sup>	216.2 <sup>d</sup>

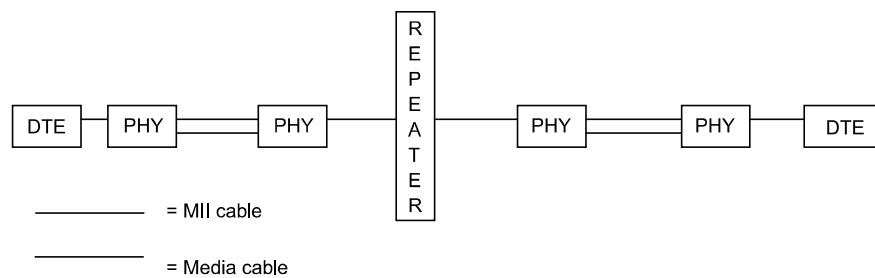
<sup>a</sup>In meters, no margin.<sup>b</sup>Assumes 100 m of balanced cable and one fiber link.<sup>c</sup>This entry included for completeness. It may be impractical to construct a T4 to FX class II repeater.<sup>d</sup>Assumes 105 m of balanced cable and one fiber link.

### 29.3.1 Round-trip collision delay

For a network to be valid, it must be possible for any two DTEs on the network to contend for the network at the same time. Each station attempting to transmit must be notified of the contention by the returned “collision” signal within the “collision window” (see 4.1.2.2 and 5.2.2.1.2). Additionally, the maximum length fragment created must contain less than 512 bits after the start-of-frame delimiter (SFD). These requirements limit the physical diameter (maximum distance between DTEs) of a network. The maximum round-trip delay must be qualified between all pairs of DTEs in the network. In practice this means that the qualification must be done between those that, by inspection of the topology, are candidates for the longest delay. The following network modeling methodology is provided to assist that calculation.

#### 29.3.1.1 Worst-case path delay value (PDV) selection

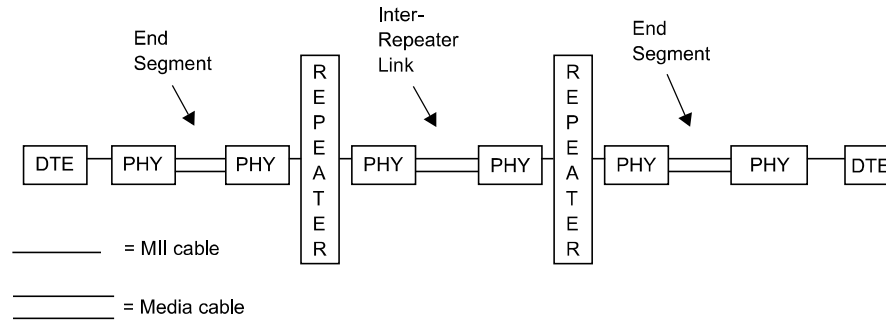
The worst-case path through a network to be validated shall be identified by examination of aggregate DTE delays, cable delays, and repeater delays. The worst case consists of the path between the two DTEs at opposite ends of the network that have the longest round-trip time. Figures 29-6 and 29-7 show schematic representations of one-repeater and two-repeater paths.

**Figure 29-6—System Model 2: Single repeater**

#### 29.3.1.2 Worst-case PDV calculation

Once a set of paths is chosen for calculation, each shall be checked for validity against the following formula:

$$\text{PDV} = \sum \text{link delays (LSDV)} + \sum \text{repeater delays} + \text{DTE delays} + \text{safety margin}$$



**Figure 29-7—System Model 2-2: Two repeaters**

Values for the formula variables are determined by the following method:

- a) Determine the delay for each link segment (Link Segment Delay Value, or LSDV), including inter-repeater links, using the formula

$$\text{LSDV} = 2 \text{ (for round-trip delay)} \times \text{segment length} \times \text{cable delay for this segment}$$

NOTES

1—Length is the sum of the cable lengths between the PHY interfaces at the repeater and the farthest DTE for End Segments plus the sum of the cable lengths between the repeater PHY interfaces for Inter-Repeater Links. All measurements are in meters.

2—Cable delay is the delay specified by the manufacturer or the maximum value for the type of cable used as shown in table 29-3. For this calculation, cable delay must be specified in bit times per meter (BT/m). Table 29-4 can be used to convert values specified relative to the speed of light (%c) or nanoseconds per meter (ns/m).

3—When actual cable lengths or propagation delays are not known, use the Max delay in bit times as specified in table 29-3 for copper cables. Delays for fiber should be calculated, as the value found in table 29-3 will be too large for most applications.

- b) Sum together the LSDVs for all segments in the path.
- c) Determine the delay for each repeater in the path. If model-specific data are not available from the manufacturer, determine the class of each repeater (I or II) and enter the appropriate default value from table 29-3.
- d) MII cables for 100BASE-T shall not exceed 0.5 m each. When evaluating system topology, MII cable delays need not be accounted for separately. Delays attributable to the MII are incorporated into DTE and repeater component delays.
- e) Use the DTE delay value shown in table 29-3 unless your equipment manufacturer defines a different value.
- f) Decide on appropriate safety margin—0 to 5 bit times—for the PDV calculation. Safety margin is used to provide additional margin to accommodate unanticipated delay elements, such as extra-long connecting cable runs between wall jacks and DTEs. (A safety margin of 4 BT is recommended.)
- g) Insert the values obtained through the calculations above into the following formula to calculate the PDV. (Some configurations may not use all the elements of the formula.)

$$\text{PDV} = \sum \text{link delays (LSDV)} + \sum \text{repeater delays} + \text{DTE delay} + \text{safety margin}$$

- h) If the PDV is less than 512, the path is qualified in terms of worst-case delay.
- i) Late collisions and/or CRC errors are indicators that path delays exceed 512 BT.

**Table 29-3—Network component delays, Transmission System Model 2**

Component	Round-trip delay in bit times per meter	Maximum round-trip delay in bit times
Two TX/FX DTEs		100
Two T4 DTEs		138
One T4 and one TX/FX DTE <sup>a</sup>		127
Cat 3 cable segment	1.14	114 (100 m)
Cat 4 cable segment	1.14	114 (100 m)
Cat 5 cable segment	1.112	111.2 (100 m)
STP cable segment	1.112	111.2 (100 m)
Fiber optic cable segment	1.0	412 (412 m)
Class I repeater		140
Class II repeater with all ports TX/FX		92
Class II repeater with any port T4		67

<sup>a</sup>Worst-case values are used (TX/FX values for MAC transmit start and MDI input to collision detect; T4 value for MDI input to MDI output).

**Table 29-4—Conversion table for cable delays**

Speed relative to c	ns/m	BT/m
0.4	8.34	0.834
0.5	6.67	0.667
0.51	6.54	0.654
0.52	6.41	0.641
0.53	6.29	0.629
0.54	6.18	0.618
0.55	6.06	0.606
0.56	5.96	0.596
0.57	5.85	0.585
0.58	5.75	0.575
0.5852	5.70	0.570
0.59	5.65	0.565
0.6	5.56	0.556
0.61	5.47	0.547
0.62	5.38	0.538
0.63	5.29	0.529
0.64	5.21	0.521
0.65	5.13	0.513
0.654	5.10	0.510
0.66	5.05	0.505
0.666	5.01	0.501
0.67	4.98	0.498
0.68	4.91	0.491
0.69	4.83	0.483
0.7	4.77	0.477
0.8	4.17	0.417
0.9	3.71	0.371

This is an Archive IEEE Standard. It has been superseded by a later version of this standard.

## 30. Layer Management for 10 Mb/s and 100 Mb/s

### 30.1 Overview

This clause provides the Layer Management specification for DTEs, repeaters, and MAUs based on the CSMA/CD access method. The clause is produced from the ISO framework additions to clause 5, Layer Management; clause 19, Repeater Management; and clause 20, MAU Management. It incorporates additions to the objects, attributes, and behaviors to support 100 Mb/s CSMA/CD.

The layout of this clause takes the same form as 5.1, 5.2, and clauses 19 and 20, although with equivalent subclauses grouped together. It identifies a common management model and framework applicable to IEEE 802.3 managed elements, and it identifies those elements and defines their managed objects, attributes, and behaviors in a protocol-independent language. It also includes a formal GDMO definition of the protocol encodings for CMIP and ISO/IEC 15802-2: 1995 [IEEE 802.1B].

NOTE—The arcs (that is, object identifier values) defined in annex 30A, the formal GDMO definitions, deprecate the arcs previously defined in Annexes D1 (Layer Management), D2 (Repeater Management), and D3 (MAU Management). See IEEE Std 802.1F-1993, annex C.4.

This clause provides the Layer Management specification for DTEs, repeaters, and MAUs based on the CSMA/CD access method. It defines facilities comprised of a set of statistics and actions needed to provide IEEE 802.3 Management services. The information in this clause should be used in conjunction with the Procedural Model defined in 4.2.7–4.2.10. The Procedural Model provides a formal description of the relationship between the CSMA/CD Layer Entities and the Layer Management facilities.

This management specification has been developed in accordance with the OSI management architecture as specified in the ISO Management Framework document, ISO/IEC 7498-4: 1989. It is independent of any particular management application or management protocol.

The management facilities defined in this standard may be accessed both locally and remotely. Thus, the Layer Management specification provides facilities that can be accessed from within a station or can be accessed remotely by means of a peer-management protocol operating between application entities.

In CSMA/CD no peer management facilities are necessary for initiating or terminating normal protocol operations or for handling abnormal protocol conditions. The monitoring of these activities is done by the carrier sense and collision detection mechanisms. Since these activities are necessary for normal operation of the protocol, they are not considered to be a function of Layer Management and are, therefore, not discussed in this clause.

Implementation of part or all of 10 Mb/s and 100 Mb/s Management is not a requirement for conformance to clauses 4, 7, 9, 22, 23, 24, 25, 26, 27, or 28.

The intent of this standard is to furnish a management specification that can be used by the wide variety of different devices that may be attached to a network specified by ISO/IEC 8802-3. Thus, a comprehensive list of management facilities is provided.

The improper use of some of the facilities described in this clause may cause serious disruption of the network. In accordance with ISO management architecture, any necessary security provisions should be provided by the Agent in the Local System Environment. This can be in the form of specific security features or in the form of security features provided by the peer communication facilities.

### 30.1.1 Scope

This clause includes selections from clauses 5, 19, and 20. It is intended to be an entirely equivalent specification for the management of 10 Mb/s DTEs, 10 Mb/s baseband repeater units, and 10 Mb/s integrated MAUs. It also includes the additions for management of 100 Mb/s DTEs, repeater units, embedded MAUs, and external PHYs connected with the MII. Implementations of management for 10 Mb/s DTEs, repeater units, and embedded MAUs should follow the requirements of this clause (e.g., a 10 Mb/s implementation should incorporate the attributes to indicate that it is not capable of 100 Mb/s operation).

This clause defines a set of mechanisms that enable management of ISO/IEC 8802-3 10 Mb/s and 100 Mb/s DTEs, baseband repeater units, and integrated Medium Attachment Units (MAUs). In addition, for ports without integral MAUs, attributes are provided for characteristics observable from the AUI of the connected DTE or repeater. Direct management of AUI MAUs that are external to their respective DTEs or repeaters is beyond the scope of this standard. The managed objects within this standard are defined in terms of their behaviour, attributes, actions, notifications, and packages in accordance with IEEE 802.1 and ISO standards for network management. Managed objects are grouped into mandatory and optional packages.

This specification is defined to be independent of any particular management application or management protocol. The means by which the managed objects defined in this standard are accessed is beyond the scope of this standard.

### 30.1.2 Relationship to objects in IEEE Std 802.1F-1993

The following managed object classes, if supported by an implementation, shall be as specified in IEEE Std 802.1F-1993: ResourceTypeID, EWMAMetricMonitor.

#### oResourceTypeID

This object class is mandatory and shall be implemented as defined in IEEE Std 802.1F-1993. This object is bound to oMAC-Entity, oRepeater, and oMAU as defined by the NAMEBINDINGS in 30A.8.1. Note that the binding to oMAU is mandatory only when MII is present. The Entity Relationship Diagram, figure 30-3, shows these bindings pictorially.

#### oEWMAMetricMonitor

This object class is optional. When implemented, it shall be implemented as defined in IEEE Std 802.1F-1993, subject to the specific requirements described below. This object is bound to system as defined by the NAMEBINDINGS in 30A.1.1, 30A.3.1, and 30A.2.1.

Implementations of IEEE 802.3 Management that support the oEWMAMetricMonitor managed object class are required to support values of granularity period as small as one second. Implementations are required to support at least one sequence of low and high thresholds. The granularity period may be set to equal to the moving time period as a minimal conformant implementation.

### 30.1.3 Systems management overview

Within the ISO Open Systems Interconnection (OSI) architecture, the need to handle the special problems of initializing, terminating, and monitoring ongoing activities and assisting in their operations, as well as handling abnormal conditions, is recognized. These needs are collectively addressed by the systems management component of the OSI architecture.

A management protocol is required for the exchange of information between systems on a network. This management standard is independent of any particular management protocol.



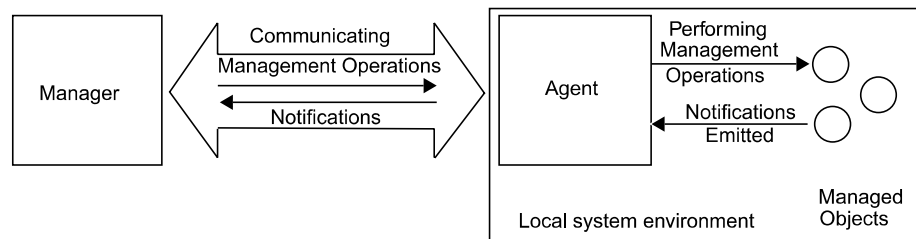
This management standard, in conjunction with the management standards of other layers, provides the means to perform various management functions. IEEE 802.3 Management collects information needed from the MAC and Physical Layers and the devices defined in IEEE 802.3. It also provides a means to exercise control over those elements.

The relationship between the various management entities and the layer entities according to the ISO model is shown in figure 30-1.

### 30.1.4 Management model

This standard describes management of DTEs, repeaters, and integrated MAUs in terms of a general model of management of resources within the open systems environment. The model, which is described in ISO/IEC 10040: 1992, is briefly summarized here.

Management is viewed as a distributed application modeled as a set of interacting management processes. These processes are executed by systems within the open environment. A managing system executes a managing process that invokes management operations. A managed system executes a process that is receptive to these management operations and provides an interface to the resources to be managed. A managed object is the abstraction of a resource that represents its properties as seen by (and for the purpose of) management. Managed objects respond to a defined set of management operations. Managed objects are also capable of emitting a defined set of notifications. This interaction of processes is shown in figure 30-1.



NOTE—Figure 1 of ISO/IEC 10040 has been reproduced with the permission of ISO. Copies of the complete standard may be obtained from the International Organization for Standardization, Case Postale 56, 1 rue de Varembe, CH-1211, Genève 20, Switzerland/Suisse.

**Figure 30-1—Interaction between manager, agent, and objects**

A managed object is a management view of a resource. The resource may be a logical construct, function, physical device, or anything subject to management. Managed objects are defined in terms of four types of elements:

- a) *Attributes*. Data-like properties (as seen by management) of a managed object.
- b) *Actions*. Operations that a managing process may perform on an object or its attributes.
- c) *Notifications*. Unsolicited reports of events that may be generated by an object.
- d) *Behaviour*. The way in which managed objects, attributes, and actions interact with the actual resources they model and with each other.

The above items are defined in 30.3, 30.4, 30.5, and 30.6 of this clause in terms of the template requirements of ISO/IEC 10165-4: 1991.

Some of the functions and resources within 802.3 devices are appropriate targets for management. They have been identified by specifying managed objects that provide a management view of the functions or resources. Within this general model, the 802.3 device is viewed as a managed device. It performs functions as defined by the applicable standard for such a device. Managed objects providing a view of those functions and resources appropriate to the management of the device are specified. The purpose of this standard is to define the object classes associated with the devices in terms of their attributes, operations, notifications, and behaviour.

## 30.2 Managed objects

### 30.2.1 Introduction

This clause identifies the Managed Object classes for IEEE 802.3 components within a managed system. It also identifies which managed objects and packages are applicable to which components.

All counters defined in this specification are assumed to be wraparound counters. Wraparound counters are those that automatically go from their maximum value (or final value) to zero and continue to operate. These unsigned counters do not provide for any explicit means to return them to their minimum (zero), i.e., reset. Because of their nature, wraparound counters should be read frequently enough to avoid loss of information. Counters in 30.3, 30.4, 30.5 and 30.6 that have maximum increment rates specified for 10 Mb/s operation, and are appropriate to 100 Mb/s operation, have ten times the stated maximum increment rate for 100 Mb/s operation unless otherwise indicated.

### 30.2.2 Overview of managed objects

Managed objects provide a means to

- Identify a resource
- Control a resource
- Monitor a resource

#### 30.2.2.1 Text description of managed objects

In case of conflict, the formal behaviour definitions in 30.3, 30.4, 30.5, and 30.6 take precedence over the text descriptions in this subclause.

##### **oMACEntity**

The top-most managed object class of the DTE portion of the containment tree shown in figure 30-3. Note that this managed object class may be contained within another superior managed object class. Such containment is expected, but is outside the scope of this standard.

##### **oPHYEntity**

Contained within oMACEntity. Many instances of oPHYEntity may coexist within one instance of oMACEntity; however, only one PHY may be active for data transfer to and from the MAC at any one time. oPHYEntity is the managed object that contains the MAU managed object in a DTE.

##### **oRepeater**

The top-most managed object class of the repeater portion of the containment tree shown in figure 30-3. Note that this managed object class may be contained within another superior managed object class. Such containment is expected, but is outside the scope of this standard.

**oRepeaterMonitor**

A managed object class called out by IEEE Std 802.1F-1993. See 30.1.2, oEWMAMetricMonitor.

**oGroup**

The group managed object class is a view of a collection of repeater ports.

**oRepeaterPort**

The repeater port managed object class provides a view of the functional link between the data transfer service and a single PMA. The attributes associated with repeater port deal with the monitoring of traffic being handled by the repeater from the port and control of the operation of the port. The Port Enable/Disable function as reported by portAdminState is preserved across events involving loss of power. The oRepeaterPort managed object contains the MAU managed object in a repeater set.

NOTE—Attachment to nonstandard PMAs is outside the scope of this standard.

**oMAU**

The managed object of that portion of the containment tree shown in figure 30-3. The attributes, notifications, and actions defined in this clause are contained within the MAU managed object. Neither counter values nor the value of MAUAdminState is required to be preserved across events involving the loss of power.

**oAutoNegotiation**

The managed object of that portion of the containment tree shown in figure 30-3. The attributes, notifications, and actions defined in this clause are contained within the MAU managed object.

**oResourceTypeID**

A managed object class called out by IEEE Std 802.1F-1993. It is used within this clause to identify manufacturer, product, and revision of managed components that implement functions and interfaces defined within IEEE 802.3. The clause 22 MII specifies two registers to carry PHY Identifier (22.2.4.3.1), which provides succinct information sufficient to support oResourceTypeID.

**30.2.2.2 Functions to support management**

Functions are defined in clauses 5, 7, 22, 23, 24, 25, 26, 27, and 28 both to facilitate unmanaged operation and managed operation. The functions in these clauses that facilitate managed operation are referenced from the text of this management clause.

**30.2.2.2.1 DTE MAC sublayer functions**

For DTE MACs, with regard to reception-related error statistics a hierarchical order has been established such that when multiple error statuses can be associated with one frame, only one status is returned to the LLC. This hierarchy in descending order is as follows:

- frameTooLong
- alignmentError
- frameCheckError
- lengthError

The counters are primarily incremented based on the status returned to the LLC; therefore, the hierarchical order of the counters is determined by the order of the status. Frame fragments are not included in any of the statistics unless otherwise stated. In implementing any of the specified actions, receptions and transmissions that are in progress are completed before the action takes effect.

### 30.2.2.2.2 Repeater functions

The Repeater Port Object class contains seven functions which are defined in this clause and are used to collect statistics on the activity received by the port. The relationship of the functions to the repeater port and to the port attributes is shown in figure 30-2.

#### Activity Timing function

The Activity Timing function measures the duration of the assertion of the CarrierEvent signal. This duration value must be adjusted by removing the value of Carrier Recovery Time (see 9.5.6.5) to obtain the true duration of activity on the network. The output of the Activity Timing function is the ActivityDuration value, which represents the duration of the CarrierEvent signal as expressed in units of bit times.

#### Carrier Event function

The Carrier Event function asserts the CarrierEvent signal when the repeater exits the IDLE state (see figure 9-2) and the port has been determined to be port N. It de-asserts the CarrierEvent signal when, for a duration of at least Carrier Recovery Time (see 9.5.6.5), both the DataIn(N) variable has the value II and the CollIn(N) variable has the value -SQE. The value N is the port assigned at the time of transition from the IDLE state.

#### Collision Event function

The Collision Event function asserts the CollisionEvent signal when the CollIn(X) variable has the value SQE. The CollisionEvent signal remains asserted until the assertion of any CarrierEvent signal due to the reception of the following event.

#### Cyclic Redundancy Check function

The Cyclic Redundancy Check function verifies that the sequence of octets output by the Framing function contains a valid Frame Check Sequence Field. The Frame Check Sequence Field is the last four octets received from the output of the Framing function. The algorithm for generating an FCS from the octet stream is specified in 3.2.8. If the FCS generated according to this algorithm is not the same as the last four octets received from the Framing function, then the FCSError signal is asserted. The FCSError signal is cleared upon the assertion of the CarrierEvent signal due to the reception of the following event.

#### Framing function

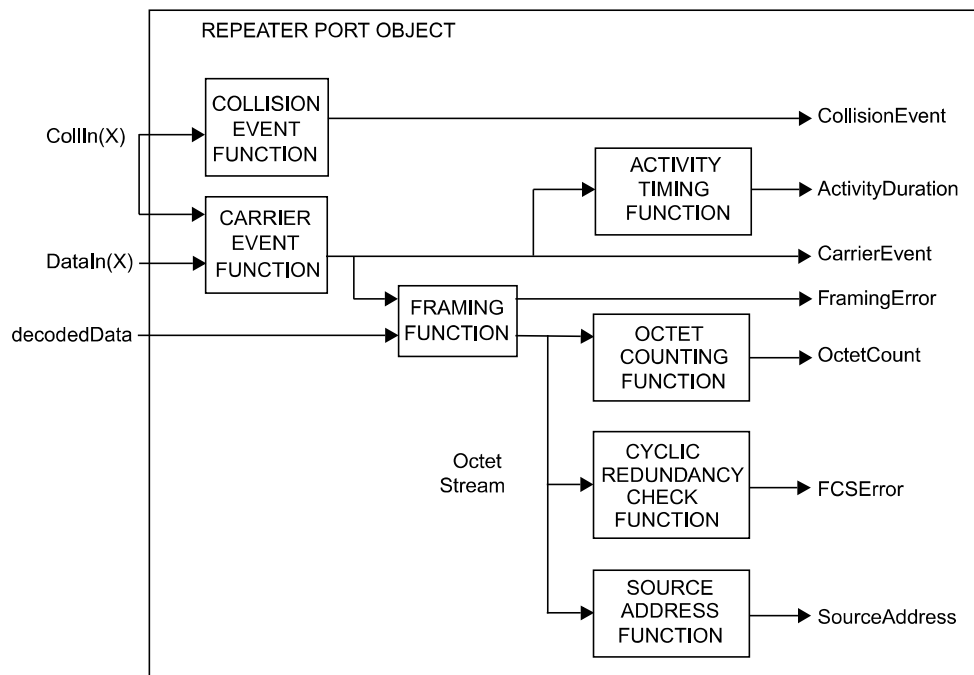
The Framing function recognizes the boundaries of an incoming frame by monitoring the CarrierEvent signal and the decoded data stream. Data bits are accepted while the CarrierEvent signal is asserted. The framing function strips preamble and start-of-frame delimiter from the received data stream. The remaining bits are aligned along octet boundaries. If there is not an integral number of octets, then FramingError shall be asserted. The FramingError signal is cleared upon the assertion of the CarrierEvent signal due to the reception of the following event.

**Octet Counting function**

The Octet Counting function counts the number of complete octets received from the output of the framing function. The output of the octet counting function is the OctetCount value. The OctetCount value is reset to zero upon the assertion of the CarrierEvent signal due to the reception of the following event.

**Source Address function**

The Source Address function extracts octets from the stream output by the framing function. The seventh through twelfth octets shall be extracted from the octet stream and output as the SourceAddress variable. The SourceAddress variable is set to an invalid state upon the assertion of the CarrierEvent signal due to the reception of the following event.



**Figure 30-2—Functions relationship**

**30.2.3 Containment**

A containment relationship is a structuring relationship for managed objects in which the existence of a managed object is dependent on the existence of a containing managed object. The contained managed object is said to be the subordinate managed object, and the containing managed object the superior managed object. The containment relationship is used for naming managed objects. The local containment relationships among object classes are depicted in the entity relationship diagram, figure 30-3. This figure also shows the names, naming attributes, and data attributes of the object classes as well as whether a particular containment relationship is one-to-one or one-to-many. For further requirements on this topic, see IEEE Std 802.1F-1993.

MAU management is only valid in a system that provides management at the next higher containment level, that is, either a DTE or repeater with management.

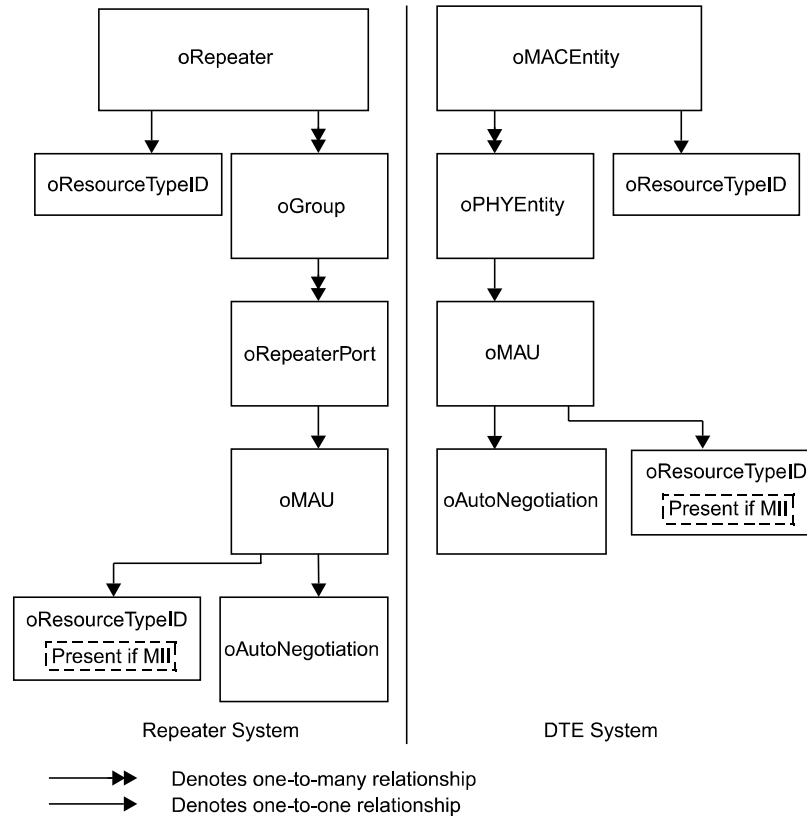


Figure 30-3—10/100 Mb/s entity relationship diagram

### 30.2.4 Naming

The name of an individual managed object is hierarchically defined within a managed system. For example, in the context of repeater management, a repeater port might be identified as “repeater 3, group 01, port 13,” that is, port 13 of group 01 of a repeater with repeaterID 3 within the managed system.

In the case of MAU management, this will present itself in one of the two forms that are appropriate for a MAU’s use, that is, as associated with a CSMA/CD interface of a DTE or with a particular port of a managed repeater. For example, a MAU could be identified as “repeater 3, group 01, port 13, MAU 1” or, that is, the MAU associated with port 13 of group 01 of a repeater with repeaterID 3 within the managed system. Examples of this are represented in the relationship of the naming attributes in the entity relationship diagram, figure 30-3.

### 30.2.5 Capabilities

This standard makes use of the concept of *packages* as defined in ISO/IEC 10165-4: 1992 as a means of grouping behaviour, attributes, actions, and notifications within a managed object class definition. Packages may either be mandatory or conditional, that is to say, present if a given condition is true. Within this standard, *capabilities* are defined, each of which corresponds to a set of packages, which are components of a number of managed object class definitions and which share the same condition for presence. Implementation of the appropriate basic and the mandatory packages is the minimum requirement for claiming conform-

ance to IEEE 802.3 10 Mb/s and 100 Mb/s Management. Implementation of an entire optional capability is required in order to claim conformance to that capability. The capabilities and packages for 10 Mb/s and 100 Mb/s Management are specified in table 30-1 (broken into tables 30-1a through 30-1d for pagination).

DTE Management has two packages that are required for management at the minimum conformance configuration—the Basic Package and the Mandatory Package. For systems that include multiple PHY entities per MAC entity, and implement the Multiple PHY Package to manage the selection of the active PHY, the optional Recommended Package shall be implemented.

For managed MAUs, the Basic Package is mandatory; all other packages are optional. For a managed MAU to be conformant to this standard, it shall fully implement the Basic Package. For a MAU to be conformant to an optional package, it shall implement that entire package. While nonconformant (reference aMAUType “other”) MAUs may utilize some or all of this clause to specify their management, conformance to this clause requires both a conformant MAU and conformant management. MAU Management is optional with respect to all other CSMA/CD Management. If an MII is present, then the conditional MII Capability must be implemented. This provides the means to identify the vendor and type of the externally connected device.

There are two distinct aspects of Repeater Management.

The first aspect provides the means to monitor and control the functions of a repeater. These functions include, but are not limited to identifying a repeater, testing and initializing a repeater, and enabling/disabling a port. This is encompassed by the mandatory Basic Control Capability.

The second aspect provides the means to monitor traffic from attached segments, and to measure traffic sourced by DTEs connected to these segments. This is done by gathering statistics on packets that enter a repeater and maintaining those statistics on a per-port basis. This is encompassed by the optional Performance Monitor Capability. The optional Address Tracking Capability provides the means to identify existence and movement of attached DTEs by their MAC addresses.

If link Auto-Negotiation is present and managed, the Auto-Negotiation managed object class shall be implemented in its entirety. All attributes and actions are mandatory.

The 100 Mb/s Monitor Capability provides additional attributes that relate to 100 Mb/s operation only. These attributes are provided to complement the counter attributes of the optional packages and capabilities that apply to 10 Mb/s and mixed 10 and 100 Mb/s implementations. It is expected that when the 100 Mb/s Monitor Capability is implemented, the appropriate complementary counter packages and capabilities are also implemented.

**Table 30-1a—Capabilities**

			DTE					Repeater			MAU									
			Basic Package (Mandatory)	Mandatory Package (Mandatory)	Recommended Package (Optional)	Optional Package (Optional)	Array Package (Optional)	Excessive Deferral Package (Optional)	Multiple PHY Package (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Control Capability (Mandatory)	Performance Monitor Capability (Optional)	Address Tracking Capability (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Package (Mandatory)	MAU Control Package (Optional)	Media Loss Tracking Package (Conditional)	Broadband DTE MAU Package (Conditional)	MII Capability (Conditional)	100 Mb/s Monitor Capability (Optional)
<b>oResourceTypeID managed object</b>																				
aResourceTypeIDName	ATTRIBUTE	GET	X							X									X	
aResourceInfo	ATTRIBUTE	GET	X							X									X	
<b>oMACEntity managed object class</b>																				
aMACID	ATTRIBUTE	GET	X																	
aFramesTransmittedOK	ATTRIBUTE	GET		X																
aSingleCollisionFrames	ATTRIBUTE	GET		X																
aMultipleCollisionFrames	ATTRIBUTE	GET		X																
aFramesReceivedOK	ATTRIBUTE	GET		X																
aFrameCheckSequenceErrors	ATTRIBUTE	GET		X																
aAlignmentErrors	ATTRIBUTE	GET		X																
aOctetsTransmittedOK	ATTRIBUTE	GET			X															
aFramesWithDeferredXmissions	ATTRIBUTE	GET			X															
aLateCollisions	ATTRIBUTE	GET			X															
aFramesAbortedDueToXSColls	ATTRIBUTE	GET			X															
aFramesLostDueToIntMACXmitError	ATTRIBUTE	GET			X															
aCarrierSenseErrors	ATTRIBUTE	GET			X															
aOctetsReceivedOK	ATTRIBUTE	GET			X															
aFramesLostDueToIntMACRcvError	ATTRIBUTE	GET			X															
aPromiscuousStatus	ATTRIBUTE	GET-SET			X															
aReadMulticastAddressList	ATTRIBUTE	GET			X															
aMulticastFramesXmittedOK	ATTRIBUTE	GET				X														
aBroadcastFramesXmittedOK	ATTRIBUTE	GET				X														
aFramesWithExcessiveDeferral	ATTRIBUTE	GET					X													
aMulticastFramesReceivedOK	ATTRIBUTE	GET				X														
aBroadcastFramesReceivedOK	ATTRIBUTE	GET				X														
aInRangeLengthErrors	ATTRIBUTE	GET				X														
aOutOfRangeLengthField	ATTRIBUTE	GET				X														
aFrameTooLongErrors	ATTRIBUTE	GET				X														
aMACEnableStatus	ATTRIBUTE	GET-SET				X														

This is an Archive IEEE Standard. It has been superseded by a later version of this standard.



**Table 30-1b—Capabilities**

			DTE							Repeater			MAU								
			Basic Package (Mandatory)	Mandatory Package (Mandatory)	Recommended Package (Optional)	Optional Package (Optional)	Array Package (Optional)	Excessive Deferral Package (Optional)	Multiple PHY Package (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Control Capability (Mandatory)	Performance Monitor Capability (Optional)	Address Tracking Capability (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Package (Mandatory)	MAU Control Package (Optional)	Media Loss Tracking Package (Conditional)	Broadband DTE MAU Package (Conditional)	MII Capability (Conditional)	100 Mb/s Monitor Capability (Optional)	Auto-Negotiation Package (Mandatory)
<b>oMACEntity managed object class (con'd.)</b>																					
aTransmitEnableStatus	ATTRIBUTE	GET-SET			X																
aMulticastReceiveStatus	ATTRIBUTE	GET-SET			X																
aReadWriteMACAddress	ATTRIBUTE	GET-SET			X																
aCollisionFrames	ATTRIBUTE	GET				X															
acInitializeMAC	ACTION		X																		
acAddGroupAddress	ACTION				X																
acDeleteGroupAddress	ACTION				X																
acExecuteSelfTest	ACTION					X															
<b>oPHYEntity managed object class</b>																					
aPHYID	ATTRIBUTE	GET	X																		
aPHYType	ATTRIBUTE	GET	X																		
aPHYTypeList	ATTRIBUTE	GET	X																		
aSQETestErrors	ATTRIBUTE	GET			X																
aSymbolErrorDuringCarrier	ATTRIBUTE	GET							X												
aMIIDetect	ATTRIBUTE	GET	X																		
aPHYAdminState	ATTRIBUTE	GET	X																		
acPHYAdminControl	ACTION								X												
<b>oRepeater managed object class</b>																					
aRepeaterID	ATTRIBUTE	GET									X										
aRepeaterType	ATTRIBUTE	GET									X										
aRepeaterGroupCapacity	ATTRIBUTE	GET									X										
aGroupMap	ATTRIBUTE	GET									X										
aRepeaterHealthState	ATTRIBUTE	GET									X										
aRepeaterHealthText	ATTRIBUTE	GET									X										
aRepeaterHealthData	ATTRIBUTE	GET									X										
aTransmitCollisions	ATTRIBUTE	GET										X									
acResetRepeater	ACTION										X										
acExecuteNonDisruptiveSelfTest	ACTION										X										
nRepeaterHealth	NOTIFICATION										X										
nRepeaterReset	NOTIFICATION										X										
nGroupMapChange	NOTIFICATION										X										

This is an Archive IEEE Standard. It has been superseded by a later version of this standard.

**Table 30-1c—Capabilities**

			DTE				Repeater				MAU										
			Basic Package (Mandatory)	Mandatory Package	Recommended Package (Optional)	Optional Package (Optional)	Array Package (Optional)	Excessive Deferral Package (Optional)	Multiple PHY Package (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Control Capability (Mandatory)	Performance Monitor Capability (Optional)	Address Tracking Capability (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Package (Mandatory)	MAU Control Package (Optional)	Media Loss Tracking Package (Conditional)	Broadband DTE MAU Package (Conditional)	MII Capability (Conditional)	100 Mb/s Monitor Capability (Optional)	Auto-Negotiation Package (Mandatory)
<b>oGroup managed object class</b>																					
aGroupID	ATTRIBUTE	GET									X										
aGroupPortCapacity	ATTRIBUTE	GET									X										
aPortMap	ATTRIBUTE	GET									X										
nPortMapChange	NOTIFICATION										X										
<b>oRepeaterPort managed object class</b>																					
aPortID	ATTRIBUTE	GET									X										
aPortAdminState	ATTRIBUTE	GET									X										
aAutoPartitionState	ATTRIBUTE	GET									X										
aReadableFrames	ATTRIBUTE	GET										X									
aReadableOctets	ATTRIBUTE	GET										X									
aFrameCheckSequenceErrors	ATTRIBUTE	GET										X									
aAlignmentErrors	ATTRIBUTE	GET										X									
aFramesTooLong	ATTRIBUTE	GET										X									
aShortEvents	ATTRIBUTE	GET										X									
aRunts	ATTRIBUTE	GET										X									
aCollisions	ATTRIBUTE	GET										X									
aLateEvents	ATTRIBUTE	GET										X									
aVeryLongEvents	ATTRIBUTE	GET										X									
aDataRateMismatches	ATTRIBUTE	GET										X									
aAutoPartitions	ATTRIBUTE	GET										X									
alsolates	ATTRIBUTE	GET																			X
aSymbolErrorDuringPacket	ATTRIBUTE	GET																			X
aLastSourceAddress	ATTRIBUTE	GET																			X
aSourceAddressChanges	ATTRIBUTE	GET																			X
acPortAdminControl	ACTION																				X

This is an Archive IEEE Standard. It has been superseded by a later version of this standard.

**Table 30-1d—Capabilities**

			DTE					Repeater			MAU										
			Basic Package (Mandatory)	Mandatory Package	Recommended Package (Optional)	Optional Package (Optional)	Array Package (Optional)	Excessive Deferral Package (Optional)	Multiple PHY Package (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Control Capability (Mandatory)	Performance Monitor Capability (Optional)	Address Tracking Capability (Optional)	100 Mb/s Monitor Capability (Optional)	Basic Package (Mandatory)	MAU Control Package (Optional)	Media Loss Tracking Package (Conditional)	Broadband DTE MAU Package (Conditional)	MII Capability (Conditional)	100 Mb/s Monitor Capability (Optional)	Auto-Negotiation Package (Mandatory)
<b>oMAU managed object class</b>																					
aMAUID	ATTRIBUTE	GET												X							
aMAUType	ATTRIBUTE	GET-SET												X							
aMAUTypeList	ATTRIBUTE	GET												X							
aMediaAvailable	ATTRIBUTE	GET												X							
aLoseMediaCounter	ATTRIBUTE	GET													X						
aJabber	ATTRIBUTE	GET												X							
aMAUAdminState	ATTRIBUTE	GET												X							
aBbMAUxmitRcvSplitType	ATTRIBUTE	GET														X					
aBroadbandFrequencies	ATTRIBUTE	GET														X					
aFalseCarriers	ATTRIBUTE	GET																	X		
acResetMAU	ACTION													X							
acMAUAdminControl	ACTION													X							
nJabber	NOTIFICATION													X							
<b>oAuto-Negotiation managed object class</b>																					
aAutoNegID	ATTRIBUTE	GET																			X
aAutoNegAdminState	ATTRIBUTE	GET																			X
aAutoNegRemoteSignaling	ATTRIBUTE	GET																			X
aAutoNegAutoConfig	ATTRIBUTE	GET-SET																			X
aAutoNegLocalTechnologyAbility	ATTRIBUTE	GET																			X
aAutoNegAdvertisedTechnologyA-	ATTRIBUTE	GET-SET																			X
aAutoNegReceivedTechnologyAbility	ATTRIBUTE	GET																			X
aAutoNegLocalSelectorAbility	ATTRIBUTE	GET																			X
aAutoNegAdvertisedSelectorAbility	ATTRIBUTE	GET-SET																			X
aAutoNegReceivedSelectorAbility	ATTRIBUTE	GET																			X
acAutoNegRestartAutoConfig	ACTION																				X
acAutoNegAdminControl	ACTION																				X
<b>Common Attributes Template</b>																					
aCMCounter	ATTRIBUTE	GET	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

This is an Archive IEEE Standard. It has been superseded by a later version of this standard.

### 30.3 Layer management for 10 Mb/s and 100 Mb/s DTEs

#### 30.3.1 MAC entity managed object class

This subclause formally defines the behaviours for the oMACEntity managed object class attributes, actions, and notifications.

##### 30.3.1.1 MAC entity attributes

###### 30.3.1.1.1 aMACID

ATTRIBUTE

APPROPRIATE SYNTAX:  
INTEGER

BEHAVIOUR DEFINED AS:

The value of aMACID is assigned so as to uniquely identify a MAC among the subordinate managed objects of the containing object.;

###### 30.3.1.1.2 aFramesTransmittedOK

ATTRIBUTE

APPROPRIATE SYNTAX:  
Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are successfully transmitted. This counter is incremented when the TransmitStatus is reported as transmitOK. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

###### 30.3.1.1.3 aSingleCollisionFrames

ATTRIBUTE

APPROPRIATE SYNTAX:  
Generalized nonresettable counter. This counter has a maximum increment rate of 13 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are involved in a single collision, and are subsequently transmitted successfully. This counter is incremented when the result of a transmission is reported as transmitOK and the attempt value is 2. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

###### 30.3.1.1.4 aMultipleCollisionFrames

ATTRIBUTE

APPROPRIATE SYNTAX:  
Generalized nonresettable counter. This counter has a maximum increment rate of 11 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are involved in more than one collision and are subsequently transmitted successfully. This counter is incremented when the TransmitStatus is reported as transmitOK and the value of the attempts variable is greater than 2 and less or equal to attemptLimit. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

**30.3.1.1.5 aFramesReceivedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are successfully received (receiveOK). This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented when the ReceiveStatus is reported as receiveOK. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.6 aFrameCheckSequenceErrors**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are an integral number of octets in length and do not pass the FCS check. This counter is incremented when the ReceiveStatus is reported as frameCheckError. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.7 aAlignmentErrors**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are not an integral number of octets in length and do not pass the FCS check. This counter is incremented when the ReceiveStatus is reported as alignmentError. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.8 aOctetsTransmittedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 1 230 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of data and padding octets of frames that are successfully transmitted. This counter is incremented when the TransmitStatus is reported as transmitOK. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

**30.3.1.1.9 aFramesWithDeferredXmissions**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 13 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames whose transmission was delayed on its first attempt because the medium was busy. This counter is incremented when the Boolean variable deferred has been asserted by the TransmitLinkMgmt function (4.2.8). Frames involved in any collisions are not counted. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

**30.3.1.1.10 aLateCollisions**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of the times that a collision has been detected later than 512 BT into the transmitted packet. A late collision is counted twice, i.e., both as a collision and as a lateCollision. This counter is incremented when the lateCollisionCount variable is nonzero. The actual update is incremented in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

**30.3.1.1.11 aFramesAbortedDueToXSColls**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 3255 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of the frames that, due to excessive collisions, are not transmitted successfully. This counter is incremented when the value of the attempts variable equals attemptLimit during a transmission. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

**30.3.1.1.12 aFramesLostDueToIntMACXmitError**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 75 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that would otherwise be transmitted by the station, but could not be sent due to an internal MAC sublayer transmit error. If this counter is incremented, then none of the other counters in this subclass is incremented. The exact meaning and mechanism for incrementing this counter is implementation dependent.;

**30.3.1.1.13 aCarrierSenseErrors**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of times that the carrierSense variable was not asserted or was deasserted during the transmission of a frame without collision (see 7.2.4.6). This counter is incremented when the carrierSenseFailure flag is true at the end of transmission. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

**30.3.1.1.14 aOctetsReceivedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 1 230 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of data and padding octets in frames that are successfully received. This does not include octets in frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented when the result of a reception is reported as a receiveOK status. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.15 aFramesLostDueToIntMACRcvError**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that would otherwise be received by the station, but could not be accepted due to an internal MAC sublayer receive error. If this counter is incremented, then none of the other counters in this subclause is incremented. The exact meaning and mechanism for incrementing this counter is implementation dependent.;

**30.3.1.1.16 aPromiscuousStatus**

ATTRIBUTE

APPROPRIATE SYNTAX:

BOOLEAN

BEHAVIOUR DEFINED AS:

A GET operation returns the value “true” for promiscuous mode enabled, and “false” otherwise.

Frames without errors received solely because this attribute has the value “true” are counted as frames received correctly; frames received in this mode that do contain errors update the appropriate error counters.

A SET operation to the value “true” provides a means to cause the LayerMgmtRecognizeAddress function to accept frames regardless of their destination address.

A SET operation to the value “false” causes the MAC sublayer to return to the normal operation of carrying out address recognition procedures for station, broadcast, and multicast group addresses (LayerMgmtRecognizeAddress function).;

**30.3.1.1.17 aReadMulticastAddressList**

ATTRIBUTE

APPROPRIATE SYNTAX:

SEQUENCE OF MAC addresses

BEHAVIOUR DEFINED AS:

The current multicast address list.;

#### **30.3.1.1.18 aMulticastFramesXmittedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are successfully transmitted, as indicated by the status value transmitOK, to a group destination address other than broadcast. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

#### **30.3.1.1.19 aBroadcastFramesXmittedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of the frames that were successfully transmitted as indicated by the TransmitStatus transmitOK, to the broadcast address. Frames transmitted to multicast addresses are not broadcast frames and are excluded. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

#### **30.3.1.1.20 aFramesWithExcessiveDeferral**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 412 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that deferred for an excessive period of time. This counter may only be incremented once per LLC transmission. This counter is incremented when the excessDefer flag is set. The actual update occurs in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

#### **30.3.1.1.21 aMulticastFramesReceivedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A count of frames that are successfully received and are directed to an active nonbroadcast group address. This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented as indicated by the receiveOK status, and the value in the destinationField. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

#### **30.3.1.1.22 aBroadcastFramesReceivedOK**

ATTRIBUTE

APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s



**BEHAVIOUR DEFINED AS:**

A count of frames that are successfully received and are directed to the broadcast group address. This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented as indicated by the receiveOK status, and the value in the destinationField. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.23 alnRangeLengthErrors**

## ATTRIBUTE

## APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

## BEHAVIOUR DEFINED AS:

A count of frames with a length field value between the minimum unpadded LLC data size and the maximum allowed LLC data size, inclusive, that does not match the number of LLC data octets received. The counter also contains frames with a length field value less than the minimum unpadded LLC data size. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.24 aOutOfRangeLengthField**

## ATTRIBUTE

## APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 16 000 counts per second at 10 Mb/s

## BEHAVIOUR DEFINED AS:

A count of frames with a length field value greater than the maximum allowed LLC data size. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.25 aFrameTooLongErrors**

## ATTRIBUTE

## APPROPRIATE SYNTAX:

Generalized nonresettable counter. This counter has a maximum increment rate of 815 counts per second at 10 Mb/s

## BEHAVIOUR DEFINED AS:

A count of frames received that exceed the maximum permitted frame size. This counter is incremented when the status of a frame reception is frameTooLong. The actual update occurs in the LayerMgmtReceiveCounters procedure (5.2.4.3).;

**30.3.1.1.26 aMACEnableStatus**

## ATTRIBUTE

## APPROPRIATE SYNTAX:

BOOLEAN

## BEHAVIOUR DEFINED AS:

True if MAC sublayer is enabled and false if disabled. This is accomplished by setting or checking the values of the receiveEnabled and transmitEnabled variables. Setting to true provides a means to cause the MAC sublayer to enter the normal operational state at idle. The PLS is reset by this operation (see 7.2.2.2.1). This is accomplished by setting receiveEnabled and transmitEnabled to true.

Setting to false causes the MAC sublayer to end all transmit and receive operations, leaving it in a disabled state. This is accomplished by setting receiveEnabled and transmitEnabled to false.;

#### **30.3.1.1.27 aTransmitEnableStatus**

ATTRIBUTE

APPROPRIATE SYNTAX:  
BOOLEAN

BEHAVIOUR DEFINED AS:

True if transmission is enabled and false otherwise. This is accomplished by setting or checking the value of the transmitEnabled variable.

Setting this to true provides a means to enable MAC sublayer frame transmission (TransmitFrame function). This is accomplished by setting transmitEnabled to true.

Setting this to false will inhibit the transmission of further frames by the MAC sublayer (TransmitFrame function). This is accomplished by setting transmitEnabled to false.;

#### **30.3.1.1.28 aMulticastReceiveStatus**

ATTRIBUTE

APPROPRIATE SYNTAX:  
BOOLEAN

BEHAVIOUR DEFINED AS:

True if multicast receive is enabled, and false otherwise. Setting this to true provides a means to cause the MAC sublayer to return to the normal operation of multicast frame reception. Setting this to false will inhibit the reception of further multicast frames by the MAC sublayer.;

#### **30.3.1.1.29 aReadWriteMACAddress**

ATTRIBUTE

APPROPRIATE SYNTAX:  
MACAddress

BEHAVIOUR DEFINED AS:

Read the MAC station address or change the MAC station address to the one supplied (RecognizeAddress function). Note that the supplied station address shall not have the group bit set and shall not be the null address.;

#### **30.3.1.1.30 aCollisionFrames**

ATTRIBUTE

APPROPRIATE SYNTAX:

A SEQUENCE of 32 generalized nonresettable counters. Each counter has a maximum increment rate of 13 000 counts per second at 10 Mb/s

BEHAVIOUR DEFINED AS:

A histogram of collision activity. The indices of this array (1 to attemptLimit – 1) denote the number of collisions experienced in transmitting a frame. Each element of this array contains a counter that denotes the number of frames that have experienced a specific number of collisions. When the TransmitStatus is reported as transmitOK and the value of the attempts variable equals n, then collisionFrames[n–1] counter is incremented. The elements of this array are incremented in the LayerMgmtTransmitCounters procedure (5.2.4.2).;

### 30.3.1.2 MAC entity actions

#### 30.3.1.2.1 acInitializeMAC

ACTION

APPROPRIATE SYNTAX:  
None required

BEHAVIOUR DEFINED AS:

This action provides a means to call the Initialize procedure (4.2.7.5). This action also results in the initialization of the PLS.;

#### 30.3.1.2.2 acAddGroupAddress

ACTION

APPROPRIATE SYNTAX:  
MACAddress

BEHAVIOUR DEFINED AS:

Add the supplied multicast group address to the address recognition filter (RecognizeAddress function).;

#### 30.3.1.2.3 acDeleteGroupAddress

ACTION

APPROPRIATE SYNTAX:  
MACAddress

BEHAVIOUR DEFINED AS:

Delete the supplied multicast group address from the address recognition filter (RecognizeAddress function).;

#### 30.3.1.2.4 acExecuteSelfTest

ACTION

APPROPRIATE SYNTAX:  
None required

BEHAVIOUR DEFINED AS:

Execute a self-test and report the results (success or failure). The actual mechanism employed to carry out the self-test is not defined in this standard. If a clause 22 MII is present then this action shall also invoke a data integrity test using MII loopback, returning to normal operation on completion of the test.;

### 30.3.2 PHY entity managed object class

This subclause formally defines the behaviours for the oPHYEntity managed object class attributes, actions and notifications. Management of that portion of the physical sublayer whose physical containment within the DTE is optional is outside the scope of this clause.