5. Ethernet YANG Module

5.1 YANG module structure

Two modules defined in this clause are focused on the configuration and monitoring of IEEE Std 802.3 Ethernet interfaces. The ieee802-ethernet-interface YANG module contains definitions of current attributes used widely in the industry in current products, while the ieee802-ethernet-interface-half-duplex YANG module contains definitions of half-duplex attributes. The ieee802-ethernet-lldp YANG module contains definitions for configuring LLDP for IEEE Std 802.3 compliant interfaces.

This standard does not have a normative requirement for data nodes of the base ietf-interfaces YANG module, but the following data nodes are supported: name, description, type, enabled, admin-status, oper-status, if-index, and phys-address.

5.2 Mapping of IEEE Std 802.3, Clause 30 managed objects

This subclause contains the mapping between YANG data nodes included in ieee802-ethernet-interface (see Table 5–1), ieee802-ethernet-interface-half-duplex (see Table 5–4) and ieee802-ethernet-lldp (see Table 5–5) - YANG modules, managed objects, and attributes defined in IEEE Std 802.3, Clause 30.
<table>
<thead>
<tr>
<th>Managed object(s)</th>
<th>Attribute(s)</th>
<th>Reference</th>
<th>Container(s)</th>
<th>Data node(s)</th>
<th>R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>oAutoNegotiation</td>
<td>acAutoNegAdminControl</td>
<td>30.6.1.2.2</td>
<td>interfaces/interface/ethernet/</td>
<td>auto-negotiation/enable</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>aAutoNegAutoConfig</td>
<td>30.6.1.1.4</td>
<td></td>
<td>negotiation-status</td>
<td>R</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td>flow-control/pause/direction</td>
<td>R/W</td>
</tr>
<tr>
<td>oMACControlFunctionEntity</td>
<td>aPAUSEMACCtrlFramesReceived</td>
<td>30.3.4.3</td>
<td></td>
<td>flow-control/pause/statistics/in-frames-pause</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aPAUSEMACCtrlFramesTransmitted</td>
<td>30.3.4.2</td>
<td></td>
<td>flow-control/pause/statistics/out-frames-pause</td>
<td>R</td>
</tr>
<tr>
<td>N/A</td>
<td>dot3HCOutPFCFrames</td>
<td></td>
<td></td>
<td>flow-control/force-flow-control</td>
<td>R/W</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td>speed</td>
<td>R/W</td>
</tr>
<tr>
<td>oMACEntity</td>
<td>aDuplexStatus</td>
<td>30.3.1.1.32</td>
<td></td>
<td>duplex</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>aMaxFrameLength</td>
<td>30.3.1.1.37</td>
<td></td>
<td>max-frame-length</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aSlowProtocolFrameLimit</td>
<td>30.3.1.1.38</td>
<td></td>
<td>frame-limit-slow-protocol</td>
<td>R</td>
</tr>
<tr>
<td>oEXTENSION</td>
<td>aEXTENSIONMACCtrlStatus</td>
<td>30.3.8.3</td>
<td></td>
<td>mac-control-extension-control</td>
<td>R</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td>capabilities/auto-negotiation</td>
<td>R</td>
</tr>
</tbody>
</table>
### Table 5–1—Mapping between IEEE Std 802.3, Clause 30 managed objects and ieee802-ethernet-interface YANG data nodes (continued)

<table>
<thead>
<tr>
<th>Managed object(s)</th>
<th>Attribute(s)</th>
<th>Reference</th>
<th>Corresponding ieee802-ethernet-interface YANG data nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>oMACEntity</td>
<td>aFramesReceivedOK</td>
<td>30.3.1.1.5</td>
<td>interfaces/interface/ethernet/statistics/frame</td>
</tr>
<tr>
<td></td>
<td>aMulticastFramesReceivedOK</td>
<td>30.3.1.1.21</td>
<td>in-multicast-frames</td>
</tr>
<tr>
<td></td>
<td>aBroadcastFramesReceivedOK</td>
<td>30.3.1.1.22</td>
<td>in-broadcast-frames</td>
</tr>
<tr>
<td></td>
<td>aFrameCheckSequenceErrors + aAlignmentErrors</td>
<td>30.4.3.1.6, 30.4.3.1.7</td>
<td>in-error-fcs-frames</td>
</tr>
<tr>
<td>oMACEntity</td>
<td>aFrameTooLongErrors</td>
<td>30.3.1.1.25</td>
<td>in-error-oversize-frames</td>
</tr>
<tr>
<td></td>
<td>aFramesLostDueToIntMACRcvError</td>
<td>30.3.1.1.15</td>
<td>in-error-mac-internal-frames</td>
</tr>
<tr>
<td></td>
<td>aFramesTransmittedOK</td>
<td>30.3.1.1.12</td>
<td>out-frames</td>
</tr>
<tr>
<td></td>
<td>aMulticastFramesXmittedOK</td>
<td>30.3.1.1.18</td>
<td>out-multicast-frames</td>
</tr>
<tr>
<td></td>
<td>aBroadcastFramesXmittedOK</td>
<td>30.3.1.1.19</td>
<td>out-broadcast-frames</td>
</tr>
<tr>
<td></td>
<td>aFramesLostDueToIntMACXmitError</td>
<td>30.3.1.1.12</td>
<td>out-error-mac-internal-frames</td>
</tr>
<tr>
<td>oPHYEntity</td>
<td>aSymbolErrorDuringCarrier</td>
<td>30.3.2.1.5</td>
<td>interfaces/interface/ethernet/statistics/phy</td>
</tr>
<tr>
<td></td>
<td>aReceiveLPITransitions</td>
<td>30.3.2.1.11</td>
<td>interfaces/interface/ethernet/statistics/phy/lpi</td>
</tr>
<tr>
<td></td>
<td>aReceiveLPIMicroseconds</td>
<td>30.3.2.1.9</td>
<td>in-lpi-time</td>
</tr>
<tr>
<td></td>
<td>aTransmitLPITransitions</td>
<td>30.3.2.1.10</td>
<td>out-lpi-transitions</td>
</tr>
<tr>
<td></td>
<td>aTransmitLPIMicroseconds</td>
<td>30.3.2.1.8</td>
<td>out-lpi-time</td>
</tr>
</tbody>
</table>
Table 5–1—Mapping between IEEE Std 802.3, Clause 30 managed objects and *ieee802-ethernet-interface* YANG data nodes *(continued)*

<table>
<thead>
<tr>
<th>Managed object(s)</th>
<th>Attribute(s)</th>
<th>Reference</th>
<th>Corresponding <em>ieee802-ethernet-interface</em> YANG data nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>oMACControIEntity</td>
<td>aUnsupportedOpcodesReceived</td>
<td>30.3.3.5</td>
<td>interfaces/interface/ethernet/statistics/mac-control</td>
</tr>
<tr>
<td>oEXTENSION</td>
<td>aEXTENSIONMACCtrlFramesReceived</td>
<td>30.3.8.2</td>
<td>in-frames-mac-control-extension</td>
</tr>
<tr>
<td></td>
<td>aEXTENSIONMACCtrlFramesTransmitted</td>
<td>30.3.8.1</td>
<td>out-frames-mac-control-extension</td>
</tr>
</tbody>
</table>

Table 5–2—Mapping between IETF RFC 2819 managed objects and *ieee802-ethernet-interface* YANG data nodes

<table>
<thead>
<tr>
<th>IETF RFC 2819 Attribute(s)</th>
<th>Corresponding <em>ieee802-ethernet-interface</em> YANG data nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>no direct object&lt;sup&gt;a&lt;/sup&gt;</td>
<td>interfaces/interface/ethernet/statistics/frame</td>
</tr>
<tr>
<td>etherStatsOctets</td>
<td>in-total-frames</td>
</tr>
<tr>
<td>etherStatsUndersizePkts + etherStatsFragments</td>
<td>in-total-octets</td>
</tr>
<tr>
<td></td>
<td>in-error-undersize-frames</td>
</tr>
</tbody>
</table>

<sup>a</sup> Can be calculated as: aFramesReceivedOK + aFrameCheckSequenceErrors + aAlignmentErrors + aFrameTooLongErrors + aFramesLostDueToMacRcvError.
### Table 5–3—Mapping between IETF RFC 3635 managed objects and ieee802-ethernet-interface YANG data nodes

<table>
<thead>
<tr>
<th>ETHERLIKE MIB Attribute(s)</th>
<th>Corresponding ieee802-ethernet-interface YANG data nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Container(s)</td>
</tr>
<tr>
<td>dot3HCInPFCFrames</td>
<td>interfaces/interface/ethernet/</td>
</tr>
<tr>
<td>dot3HCOutPFCFrames</td>
<td>flow-control/pfc{ethernet-pfc} / statistics/out-frames-pfc</td>
</tr>
</tbody>
</table>

### Table 5–4—Mapping between IEEE Std 802.3, Clause 30 managed objects and ieee802-ethernet-interface-half-duplex YANG data nodes

<table>
<thead>
<tr>
<th>Managed object(s)</th>
<th>Attribute(s)</th>
<th>Reference</th>
<th>Corresponding ieee802-ethernet-interface-half-duplex YANG data nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Container(s)</td>
</tr>
<tr>
<td>oMACEntity</td>
<td>aRateControlAbility 30.3.1.1.33</td>
<td>interfaces/interface/ethernet</td>
<td>dynamic-rate-control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>interfaces/interface/ethernet/capability</td>
<td>dynamic-rate-control-supported</td>
</tr>
<tr>
<td>oPHYEntity</td>
<td>aSQETestErrors 30.3.2.1.4</td>
<td>interfaces/interface/ethernet/statistics/frame/csmacd{csma-cd}</td>
<td>in-errors-sqe-test</td>
</tr>
<tr>
<td>oMACEntity</td>
<td>aSingleCollisionFrames 30.3.1.1.3</td>
<td></td>
<td>out-frames-collision-single</td>
</tr>
<tr>
<td></td>
<td>aMultipleCollisionFrames 30.3.1.1.4</td>
<td></td>
<td>out-frames-collision-multiple</td>
</tr>
<tr>
<td></td>
<td>aFramesWithDeferredXmissions 30.3.1.1.9</td>
<td></td>
<td>out-frames-deferred</td>
</tr>
<tr>
<td></td>
<td>aFramesAbortedDueToXSColls 30.3.1.1.11</td>
<td></td>
<td>out-frames-collisions-excessive</td>
</tr>
<tr>
<td></td>
<td>aLateCollisions 30.3.1.1.10</td>
<td></td>
<td>out-collisions-late</td>
</tr>
<tr>
<td></td>
<td>aCarrierSenseErrors 30.3.1.1.13</td>
<td></td>
<td>out-errors-carrier-sense</td>
</tr>
<tr>
<td></td>
<td>aCollisionFrames 30.3.1.1.30</td>
<td></td>
<td>collision-histogram/collision-count-frames</td>
</tr>
</tbody>
</table>
Table 5–5—Mapping between IEEE Std 802.3, Clause 30 managed objects and ieee802-ethernet-interface-half-duplex YANG data nodes

<table>
<thead>
<tr>
<th>Managed object(s)</th>
<th>Attribute(s)</th>
<th>Reference</th>
<th>Corresponding ieee802-ethernet-lldp YANG data nodes</th>
<th>R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>oLldpXdot3Config</td>
<td>aLldpXdot3PortConfigTLVsPortConfigEnable</td>
<td>30.12.1.1.1</td>
<td>lldp/port-trlv-config-enable</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>oLldpXdot3LocSystem</td>
<td>30.12.2.1</td>
<td>auto-negotiation-supported</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPortAutoNegSupported</td>
<td>30.12.2.2.2</td>
<td>auto-negotiation-enabled</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPortAutoNegEnabled</td>
<td>30.12.2.2.2</td>
<td>auto-negotiation-cap</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPortOperMauType</td>
<td>30.12.2.2.2</td>
<td>operational-mau-type</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPowerPortClass</td>
<td>30.12.2.2.2</td>
<td>power-port-class</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPowerMDISupport</td>
<td>30.12.2.2.2</td>
<td>mdi-power-supported</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPowerMDIEnabled</td>
<td>30.12.2.2.2</td>
<td>mdi-power-enabled</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>aLldpXdot3LocPowerPairControllable</td>
<td>30.12.2.2.2</td>
<td>power-pair-controllable</td>
<td>R</td>
</tr>
<tr>
<td>Managed object(s)</td>
<td>Attribute(s)</td>
<td>Reference</td>
<td>Corresponding ieee802-ethernet-lldp YANG data nodes</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------</td>
<td>-----------</td>
<td>-----------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.9</td>
<td>power-pairs</td>
<td>R</td>
<td>power-pairs</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.10</td>
<td>local-power-class</td>
<td>R</td>
<td>local-power-class</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.11</td>
<td>link-aggregation-status</td>
<td>R</td>
<td>link-aggregation-status</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.12</td>
<td>aggregation-port-id</td>
<td>R</td>
<td>aggregation-port-id</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.13</td>
<td>local-max-frame-size</td>
<td>R</td>
<td>local-max-frame-size</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.14</td>
<td>power-type</td>
<td>R</td>
<td>power-type</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.15</td>
<td>power-source</td>
<td>R</td>
<td>power-source</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.16</td>
<td>local-power-priority</td>
<td>R/W</td>
<td>local-power-priority</td>
<td></td>
</tr>
<tr>
<td>30.12.2.1.17</td>
<td>pd-requested-power-value</td>
<td>R</td>
<td>pd-requested-power-value</td>
<td></td>
</tr>
<tr>
<td>30.12.3.1.1</td>
<td>auto-negotiation-supported</td>
<td>R</td>
<td>auto-negotiation-supported</td>
<td></td>
</tr>
<tr>
<td>30.12.3.1.2</td>
<td>auto-negotiation-enabled</td>
<td>R</td>
<td>auto-negotiation-enabled</td>
<td></td>
</tr>
<tr>
<td>30.12.3.1.3</td>
<td>auto-negotiation-cap</td>
<td>R</td>
<td>auto-negotiation-cap</td>
<td></td>
</tr>
<tr>
<td>30.12.3.1.4</td>
<td>operational-mau-type</td>
<td>R</td>
<td>operational-mau-type</td>
<td></td>
</tr>
<tr>
<td>30.12.3.1.5</td>
<td>power-port-class</td>
<td>R</td>
<td>power-port-class</td>
<td></td>
</tr>
<tr>
<td>30.12.3.1.6</td>
<td>mdi-power-supported</td>
<td>R</td>
<td>mdi-power-supported</td>
<td></td>
</tr>
</tbody>
</table>

Continue when YANG has been updated from supporting 802.3-2015 to 802.3-2022.
### IEEE Std 802.3, Clause 30

**Managed object(s)** | **Attribute(s)** | **Reference** | **Container(s)** | **Data node(s)** | **R/W**
---|---|---|---|---|---
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerMDIEnabled` | 30.12.3.1.7 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerPairControllable` | 30.12.3.1.8 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerPairs` | 30.12.3.1.9 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerClass` | 30.12.3.1.10 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemLinkAggStatus` | 30.12.3.1.11 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemLinkAggPortId` | 30.12.3.1.12 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemMaxFrameSize` | 30.12.3.1.13 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerType` | 30.12.3.1.14 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerSource` | 30.12.3.1.15 | **R** | **R**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPowerPriority` | 30.12.3.1.16 | **R** | **RW**
`IEEE802-ethernet-lldp` | `lldpXdl03RemPDRequestedPowerValue` | 30.12.3.1.17 | **R** | **R**

Continue when YANG has been updated from supporting 802.3-2015 to 802.3-2022
5.3 YANG module definition

The YANG module tree hierarchy uses terms defined in IETF RFC 8407.

5.3.1 Tree hierarchy

module: ieee802-ethernet-interface
  augment /if:interfaces/if:interface:
    +--rw ethernet
      +--rw auto-negotiation!
        |  +--rw enable?   boolean
        |  +--ro negotiation-status?    enumeration
      +--rw duplex?
        |  +--ro speed?    eth-if-speed-type
      +--rw flow-control
        |  +--rw pause {ethernet-pause}?
        |     |  +--rw direction?    pause-fc-direction-type
        |     |  +--ro statistics
        |     |     +--ro in-frames-pause?    yang:counter64
        |     |  +--ro out-frames-pause?    yang:counter64
      +--rw pfc {ethernet-pfc}?
        |  +--rw enable?       boolean
        |  +--ro statistics
        |     +--ro in-frames-pfc?    yang:counter64
        |  +--ro out-frames-pfc?    yang:counter64
      +--rw force-flow-control?    boolean
      +--ro max-frame-length?    uint16
      +--ro mac-control-extension-control?    boolean
      +--ro frame-limit-slow-protocol?    uint64
      +--ro capabilities
        |  +--ro auto-negotiation?    boolean
      +--ro statistics
        +--ro frame
          |  +--ro in-total-frames?    yang:counter64
          |  +--ro in-total-octets?    yang:counter64
          |  +--ro in-frames?    yang:counter64
          |  +--ro in-multicast-frames?    yang:counter64
          |  +--ro in-broadcast-frames?    yang:counter64
          |  +--ro in-error-fcs-frames?    yang:counter64
          |  +--ro in-error-undersize-frames?    yang:counter64
          |  +--ro in-error-oversize-frames?    yang:counter64
          |  +--ro in-error-mac-internal-frames?    yang:counter64
          |  +--ro out-frames?    yang:counter64
          |  +--ro out-multicast-frames?    yang:counter64
          |  +--ro out-broadcast-frames?    yang:counter64
          |  +--ro out-error-mac-internal-frames?    yang:counter64
      +--ro phy
        |  +--ro in-error-symbol?    yang:counter64
        |  +--ro lpi
          |  +--ro in-lpi-transitions?    yang:counter64
          |  +--ro in-lpi-time?    decimal64

\(^{\text{Copyright release for YANG modules: Users of this standard may freely reproduce the YANG module contained in this subclause so that it can be used for its intended purpose.}}\)
+--ro out-lpi-transitions?   yang:counter64
|   +--ro out-lpi-time?   decimal64
+--ro mac-control
    +--ro in-frames-mac-control-unknown?   yang:counter64
    +--ro in-frames-mac-control-extension?   yang:counter64
    +--ro out-frames-mac-control-extension?   yang:counter64

module: ieee802-ethernet-interface-half-duplex
  augment /if:interfaces/if:interface/ieee802-eth-if:ethernet:
    +--rw dynamic-rate-control?   dynamic-rate-control-type (dynamic-rate-control)?
  augment /if:interfaces/if:interface/ieee802-eth-if:ethernet/ieee802-eth-if:capabilities:
    +--ro dynamic-rate-control-supported?   boolean (dynamic-rate-control)?
  augment /if:interfaces/if:interface/ieee802-eth-if:ethernet/ieee802-eth-if:statistics/ieee802-eth-if:frame:
    +--ro csma-cd (csma-cd)?
    +--ro in-errors-sqe-test?   yang:counter64
    +--ro out-frames-collision-single?   yang:counter64
    +--ro out-frames-collision-multiple?   yang:counter64
    +--ro out-frames-deferred?   yang:counter64
    +--ro out-frames-collisions-excessive?   yang:counter64
    +--ro out-collisions-late?   yang:counter64
    +--ro out-errors-carrier-sense?   yang:counter64
    +--ro collision-histogram* [collision-count]
        +--ro collision-count   yang:counter64
        +--ro collision-count-frames?   yang:counter64
5.3.2 YANG module

In the following YANG module definitions, should any discrepancy between the text of the description for individual YANG nodes and the corresponding definition in 5.2 through 5.3 of this clause occur, the definitions and mappings in 5.3 shall take precedence.

An ASCII text version of the Ethernet YANG module can be found at the following URL:\k

5.3.2.1 Ethernet interface module

module ieee802-ethernet-interface {
  yang-version 1.1;

  namespace
    "urn:ieee:std:802.3:yang:ieee802-ethernet-interface";

  prefix ieee802-eth-if;

  revision 2019-06-21 {
    description "Initial revision.";

    import ietf-yang-types {
      prefix yang;
      reference "IETF RFC 6991";
    }

    import ietf-interfaces {
      prefix if;
      reference "IETF RFC 8343";
    }

    import iana-if-type {
      prefix ianaift;
      reference "http://www.iana.org/assignments/yang-parameters/iana-if-type@2018-07-03.yang";
    }

    organization
      "IEEE Std 802.3 Ethernet Working Group
      Web URL: http://www.ieee802.org/3/";

    contact
      "Web URL: http://www.ieee802.org/3/";

    description
      "This module contains YANG definitions for configuring IEEE Std 802.3 Ethernet Interfaces.
      In this YANG module, 'Ethernet interface' can be interpreted as referring to 'IEEE Std 802.3 compliant Ethernet";

\kCopyright release for YANG modules: Users of this standard may freely reproduce the YANG module contained in this subclause so that it can be used for its intended purpose.
interfaces'.

reference "IEEE Std 802.3-2018, unless dated explicitly"

typedef eth-if-speed-type {
    type decimal64 {
        fraction-digits 3;
    }
    units "Gb/s";
    description "Used to represent the configured, negotiated, or actual speed of an Ethernet interface in Gigabits per second (Gb/s), accurate to 3 decimal places (i.e., accurate to 1 Mb/s).";
}

typedef duplex-type {
    type enumeration {
        enum full {
            description "Full duplex."
        }
        enum half {
            description "Half duplex."
        }
        enum unknown {
            description "Link is currently disconnected or initializing."
        }
    }
    default full;
    description "Used to represent the configured, negotiated, or actual duplex mode of an Ethernet interface.";
    reference "IEEE Std 802.3, 30.3.1.1.32, aDuplexStatus"
}

typedef pause-fc-direction-type {
    type enumeration {
        enum "disabled" {
            description "Flow-control disabled in both ingress and egress directions, i.e., PAUSE frames are not transmitted and PAUSE frames received in the ingress direction are discarded without processing."
        }
        enum "ingress-only" {
            description "PAUSE frame based flow control is enabled in the ingress direction only, i.e., PAUSE frames may be transmitted to reduce the ingress traffic flow, but PAUSE frames received in the ingress direction are discarded without reducing the egress traffic rate."
        }
    }
}
enum "egress-only" {
    description
    "PAUSE frame based flow control is enabled in the egress
direction only, i.e., PAUSE frames are not transmitted,
but PAUSE frames received in the ingress direction are
processed to reduce the egress traffic rate.";
}
enum "bi-directional" {
    description
    "PAUSE frame based flow control is enabled in both ingress
and egress directions, i.e., PAUSE frames may be
transmitted to reduce the ingress traffic flow, and
PAUSE frames received on ingress are processed to reduce
the egress traffic rate.";
}
enum "undefined" {
    description
    "Link is currently disconnected or initializing.";
}
}
description
"Used to represent the configured, negotiated, or actual
PAUSE frame-based flow control setting.";
reference
"IEEE Std 802.3.1, dot3PauseAdminMode and dot3PauseOperMode";
}
feature ethernet-pfc {
    description
    "This device supports Ethernet priority flow-control.";
}
feature ethernet-pause {
    description
    "This device supports Ethernet PAUSE.";
}
}
augment "/if:interfaces/if:interface" {
    when "derived-from-or-self(if:type, 'ianaift:ethernetCsmacd')" {
        description
        "Applies to all P2P Ethernet interfaces.";
    }
    description
    "Augment interface model with Ethernet interface
specific configuration nodes.";
}
container ethernet {
    description
    "Contains all Ethernet interface related configuration.";
}
container auto-negotiation {
    presence
    "The presence of this container indicates that
auto-negotiation is supported on this Ethernet interface.

description
"Contains auto-negotiation transmission parameters

This container contains a data node that allows the advertised duplex value in the negotiation to be restricted.

If not specified then the default behavior for the duplex data node is to negotiate all available values for the particular type of Ethernet PHY associated with the interface.

If auto-negotiation is enabled, and PAUSE frame based flow control has not been explicitly configured, then the default PAUSE frame based flow control capabilities that are negotiated allow for bi-directional or egress-only PAUSE frame based flow control.

If auto-negotiation is enabled, and PAUSE frame based flow control has been explicitly configured, then the configuration settings restrict the values that may be negotiated. However, it should be noted that the protocol does not allow only egress PAUSE frame based flow control to be negotiated without also allowing bi-directional PAUSE frame based flow control."

reference
"IEEE Std 802.3, Clause 28 and Annexes 28A-D";

leaf enable {
  type boolean;
  default true;

description
"Controls whether auto-negotiation is enabled or disabled.
For interface types that support auto-negotiation then it defaults to being enabled.

For interface types that do not support auto-negotiation, the related configuration data is ignored.";

leaf negotiation-status {
  when "../enable = 'true'";
  type enumeration {
    enum in-progress {
      description
      "The auto-negotiation protocol is running and negotiation is currently in-progress.";
    }
    enum complete {
      description
      "The auto-negotiation protocol has completed";
    }
  }
}
 successfully; }
enum failed {
  description
  "The auto-negotiation protocol has failed.";
}
enum unknown {
  description
  "The auto-negotiation status is not currently known,
  this could be because it is still negotiating or the
  protocol cannot run (e.g., if no medium is present).";
}
enum no-negotiation {
  description
  "No auto-negotiation is executed.
  The auto-negotiation function is either not supported
  on this interface or has not been enabled.";
}
config false;

description
  "The status of the auto-negotiation protocol.";
reference
  "IEEE 802.3, 30.6.1.1.4, aAutoNegAutoConfig";
}

leaf duplex {
  type duplex-type;
  description
    "Operational duplex mode of the Ethernet interface.";
  reference
    "IEEE Std 802.3, 30.3.1.1.32 aDuplexStatus";
}

leaf speed {
  type eth-if-speed-type;
  units "Gb/s";
  description
    "Operational speed (data rate) of the Ethernet interface.
    The default value is implementation-dependent.";
}

container flow-control {
  description
    "Holds the different types of Ethernet PAUSE frame based
    flow control that can be enabled.";
  container pause {
    if-feature "ethernet-pause";
    description
      "IEEE Std 802.3 PAUSE frame based PAUSE frame based flow
      control.";
    reference
      "IEEE 802.3, 30.6.1.1.4, aAutoNegAutoConfig";
  }
"IEEE Std 802.3, Annex 31B"

leaf direction {
    type pause-fc-direction-type;
    description
        "Indicates which direction PAUSE frame based flow
        control is enabled in, or whether it is disabled.
        The default flow-control settings are vendor specific.
        If auto-negotiation is enabled, then PAUSE based
        flow-control is negotiated by default.
        The default value is implementation-dependent."
}

container statistics {
    config false;
    description
        "Contains the number of PAUSE frames received or
        transmitted.";
    leaf in-frames-pause {
        type yang:counter64;
        units frames;
        description
            "A count of PAUSE MAC Control frames transmitted on
            this Ethernet interface.
            Discontinuities in the values of counters in
            this container can occur at re-initialization of the
            management system, and at other times as indicated
            by the value of the 'discontinuity-time' leaf
            defined in the ietf-interfaces YANG module
            (IETF RFC 8343).";
        reference
            "IEEE Std 802.3, 30.3.4.3 aPAUSEMACCtrlFramesReceived"
    }
    leaf out-frames-pause {
        type yang:counter64;
        units frames;
        description
            "A count of PAUSE MAC Control frames transmitted on
            this Ethernet interface.
            Discontinuities in the values of counters in
            this container can occur at re-initialization of the
            management system, and at other times as indicated
            by the value of the 'discontinuity-time' leaf
            defined in the ietf-interfaces YANG module
            (IETF RFC 8343).";
        reference
            "IEEE Std 802.3, 30.3.4.2 aPAUSEMACCtrlFramesTransmitted"
    }
}

container pfc {
if-feature "ethernet-pfc";
description
  "IEEE Std 802.3 Priority-based flow control.";
reference
  "IEEE Std 802.3, Annex 31D";
leaf enable {
  type boolean;

  description
    "True indicates that IEEE Std 802.3 priority-based
    flow control is enabled, false indicates that
    IEEE Std 802.3 priority-based flow control is disabled.
    For interfaces that have auto-negotiation,
    the priority-based flow control is enabled by default.";
}
container statistics {
  config false;
  description
    "This container collects all statistics for
    Ethernet interfaces.";

  leaf in-frames-pfc {
    type yang:counter64;
    units frames;
    description
      "A count of PFC MAC Control frames received on this
      Ethernet interface.

      Discontinuities in the values of counters in
      this container can occur at re-initialization of the
      management system, and at other times as indicated
      by the value of the 'discontinuity-time' leaf
      defined in the ietf-interfaces YANG module
      (IETF RFC 8343).";
    reference
      "IEEE Std 802.3.1, dot3HCInPFCFrames";
  }

  leaf out-frames-pfc {
    type yang:counter64;
    units frames;
    description
      "A count of PFC MAC Control frames transmitted on
      this interface.

      Discontinuities in the values of counters in
      this container can occur at re-initialization of the
      management system, and at other times as indicated
      by the value of the 'discontinuity-time' leaf
      defined in the ietf-interfaces YANG module
      (IETF RFC 8343).";
    reference
      "
"IEEE Std 802.3.1, dot3HCInPFCFrames";

leaf force-flow-control {
  type boolean;
  default false;
  description
    "Explicitly forces the local PAUSE frame based flow control
    settings regardless of what has been negotiated.
    Since the auto-negotiation of flow-control settings
    does not allow all sane combinations to be negotiated
    (e.g., consider a device that is only capable of sending
    PAUSE frames connected to a peer device that is only
    capable of receiving and acting on PAUSE frames) and
    failing to agree on the flow-control settings does not
    cause the auto-negotiation to fail completely, then it is
    sometimes useful to be able to explicitly enable
    particular PAUSE frame based flow control settings on
    the local device regardless of what is being advertised
    or negotiated.";
  reference
    "IEEE Std 802.3, Table 28B-3";
}

leaf max-frame-length {
  type uint16;
  units octets;
  config false;
  description
    "This indicates the MAC frame length (including FCS bytes)
    at which frames are dropped for being too long.";
  reference
    "IEEE Std 802.3, 30.3.1.1.37 aMaxFrameLength";
}

leaf mac-control-extension-control {
  type boolean;
  config false;
  description
    "A value that identifies the current EXTENSION MAC Control
    function, as specified in IEEE Std 802.3, Annex 31C.";
  reference
    "IEEE Std 802.3, 30.3.8.3 aEXTENSIONMACCtrlStatus
    IEEE Std 802.3.1, dot3ExtensionMacCtrlStatus ";
}

leaf frame-limit-slow-protocol {
  type uint64;
  units f/s;
  default 10;
config false;
description  
  "The maximum number of Slow Protocol frames of a given subtype that can be transmitted in a one second interval. The default value is 10.";
reference  
  "IEEE Std 802.3, 30.3.1.1.38 aSlowProtocolFrameLimit";
}

container capabilities {
  config false;
description  
  "Container all Ethernet interface specific capabilities.";

  leaf auto-negotiation {
    type boolean;
description  
    "Indicates whether auto-negotiation may be configured on this interface.";
  }
}

container statistics {
  config false;
description  
  "Contains statistics specific to Ethernet interfaces.

  Discontinuities in the values of counters in the container can occur at re-initialization of the management system, and at other times as indicated by the value of the 'discontinuity-time' leaf defined in the ietf-interfaces YANG module (IETF RFC 8343).";

  container frame {
    description  
      "Contains frame statistics specific to Ethernet interfaces.

      All octet frame lengths include the 4 byte FCS.

      Error counters are only reported once ... 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 Std 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

      A frame that is counted by an instance of this object is also counted by the corresponding instance of 'in-errors' leaf defined in the ietf-interfaces YANG module (IETF RFC 8343).";  
  }
}
Discontinuities in the values of counters in the container can occur at re-initialization of the management system, and at other times as indicated by the value of the 'discontinuity-time' leaf defined in the ietf-interfaces YANG module (IETF RFC 8343).

leaf in-total-frames {
  type yang:counter64;
  units frames;
  description
  "The total number of frames (including bad frames)
  received on the Ethernet interface."
  
  This counter is calculated by summing the following IEEE Std 802.3, Clause 30 counters:
  aFramesReceivedOK +
  aFrameCheckSequenceErrors +
  aAlignmentErrors +
  aFrameTooLongErrors +
  aFramesLostDueToIntMACRcvError

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter."

  reference
  "IEEE Std 802.3, Clause 30 counters, as specified
  in the description above.";
}

leaf in-total-octets {
  type yang:counter64;
  units octets;
  description
  "The total number of octets of data (including those in
  bad frames) received on the Ethernet interface."

  Includes the 4-octet FCS.

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter."

  reference
  "IETF RFC 2819, etherStatsOctets";
}

leaf in-frames {
  type yang:counter64;
  units frames;
  description
  "A count of frames (including unicast, multicast and
  broadcast) that have been successfully received on the
Ethernet interface.

This count does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error.

Also see the 'description' statement associated with the parent 'statistics' container for additional common semantics related to this counter.;

reference
"IEEE Std 802.3, 30.3.1.1.5 aFramesReceivedOK";

leaf in-multicast-frames {
  type yang:counter64;
  units frames;
  description
  "A count of multicast frames that have been successfully received on the Ethernet interface.

  This counter represents a subset of the frames counted by in-frames.

  This count does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error.

  Also see the 'description' statement associated with the parent 'statistics' container for additional common semantics related to this counter.";

  reference
  "IEEE Std 802.3, 30.3.1.1.21 aMulticastFramesReceivedOK";
}

leaf in-broadcast-frames {
  type yang:counter64;
  units frames;
  description
  "A count of broadcast frames that have been successfully received on the Ethernet interface.

  This counter represents a subset of the frames counted by in-frames.

  This count does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error.

  Also see the 'description' statement associated with the parent 'statistics' container for additional common semantics related to this counter.";
reference
"IEEE Std 802.3, 30.3.1.1.22 aBroadcastFramesReceivedOK";
}

leaf in-error-fcs-frames {
  type yang:counter64;
  units frames;
  description
  "A count of receive frames that are of valid length,
  but do not pass the FCS check, regardless of whether
  or not the frames are an integral number of octets in
  length.

  This count effectively comprises
  aFrameCheckSequenceErrors and aAlignmentErrors added
  together.

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter.";
  reference
  "IEEE Std 802.3, 30.3.1.1.6 aFrameCheckSequenceErrors;
   IEEE Std 802.3, 30.3.1.1.7 aAlignmentErrors"
}

leaf in-error-undersize-frames {
  type yang:counter64;
  units frames;
  description
  "A count of frames received on a particular Ethernet
  interface that are less than 64 bytes in length, and
  are discarded.

  This counter is incremented regardless of whether the
  frame passes the FCS check.

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter.";
  reference
  "IETF RFC 2819, etherStatsUndersizePkts and
   etherStatsFragments";
}

leaf in-error-oversize-frames {
  type yang:counter64;
  units frames;
  description
  "A count of frames received on a particular Ethernet
  interface that exceed the maximum permitted frame
  size, that is specified in max-frame-length, and are
  discarded."
This counter is incremented regardless of whether the frame passes the FCS check.

Also see the 'description' statement associated with the parent 'statistics' container for additional common semantics related to this counter.

reference "IEEE Std 802.3, 30.3.1.1.25 aFrameTooLongErrors";

leaf in-error-mac-internal-frames {
  type yang:counter64;
  units frames;
  description
  "A count of frames for which reception on a particular Ethernet 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 in-error-fcs-frames, in-error-undersize-frames, or in-error-oversize-frames. 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 Ethernet interface that are not otherwise counted.

  Also see the 'description' statement associated with the parent 'statistics' container for additional common semantics related to this counter."

  reference "IEEE Std 802.3, 30.3.1.1.15 aFramesLostDueToIntMACRcvError";
}

leaf out-frames {
  type yang:counter64;
  units frames;
  description
  "A count of frames (including unicast, multicast and broadcast) that have been successfully transmitted on the Ethernet interface.

  Also see the 'description' statement associated with the parent 'statistics' container for additional common semantics related to this counter."

  reference "IEEE Std 802.3, 30.3.1.1.2 aFramesTransmittedOK";
}
leaf out-multicast-frames {
  type yang:counter64;
  units frames;
  description
  "A count of multicast frames that have been
  successfully transmitted on the Ethernet interface.

  This counter represents a subset of the frames counted
  by out-frames.

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter."

  reference
  "IEEE Std 802.3, 30.3.1.1.18 aMulticastFramesXmittedOK";
}

leaf out-broadcast-frames {
  type yang:counter64;
  units frames;
  description
  "A count of broadcast frames that have been
  successfully transmitted on the Ethernet interface.

  This counter represents a subset of the frames counted
  by out-frames.

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter."

  reference
  "IEEE Std 802.3, 30.3.1.1.19 aBroadcastFramesXmittedOK";
}

leaf out-error-mac-internal-frames {
  type yang:counter64;
  units frames;
  description
  "A count of frames for which transmission on a
  particular Ethernet interface fails due to an internal
  MAC sublayer transmit error.

  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 Ethernet
  interface that are not otherwise counted.

  Also see the 'description' statement associated with
  the parent 'statistics' container for additional
  common semantics related to this counter.";
container phy {
    description
    "Ethernet statistics related to the PHY layer.
    Discontinuities in the values of counters in the
    container can occur at re-initialization of the
    management system, and at other times as indicated by
    the value of the 'discontinuity-time' leaf defined in
    the ietf-interfaces YANG module (IETF RFC 8343).";
    leaf in-error-symbol {
        type yang:counter64;
        units errors;
        description
        "A count of the number of symbol errors that have
        occurred.
        For the precise definition of when the symbol error
        counter is incremented, please see the 'description'
        text associated with aSymbolErrorDuringCarrier,
        specified in IEEE Std 802.3, 30.3.2.1.5.
        Also see the 'description' statement associated with
        the parent 'phy-statistics' container for additional
        common semantics related to this counter."
        reference
        "IEEE Std 802.3, 30.3.2.1.5 aSymbolErrorDuringCarrier";
    }
}

container lpi {
    description
    "Physical Ethernet statistics for the energy efficiency
    related low power idle indications.";
    leaf in-lpi-transitions {
        type yang:counter64;
        units transitions;
        description
        "A count of occurrences of the transition from
        DEASSERT to ASSERT of the LPI_INDICATE
        parameter. The indication reflects the state of the
        PHY according to the requirements of the RS (see
        IEEE Std 802.3, 22.7, 35.4, and 46.4).
        Also see the 'description' statement associated with
        the parent 'phy-statistics' container for additional
        common semantics related to this counter.";
    }
}
leaf in-lpi-time {
  type decimal64 {
    fraction-digits 6;
  }
  units seconds;
  description
  "A count reflecting the total amount of time (in
  seconds) that the LPI_REQUEST parameter has the
  value ASSERT. The request is indicated to the PHY
  according to the requirements of the RS (see IEEE Std
  802.3, 22.7, 35.4, and 46.4).

  Also see the 'description' statement associated with
  the parent 'phy-statistics' container for additional
  common semantics related to this counter.";
}

leaf out-lpi-transitions {
  type yang:counter64;
  units transitions;
  description
  "A count of occurrences of the transition from state
  LPI_DEASSERTED to state LPI_ASSERTED in the LPI
  transmit state diagram of the RS. The state
  transition corresponds to the assertion of the
  LPI_REQUEST parameter. The request is indicated to
  the PHY according to the requirements of the RS (see
  IEEE Std 802.3, 22.7, 35.4, 46.4.)

  Also see the 'description' statement associated with
  the parent 'phy-statistics' container for additional
  common semantics related to this counter.";
}

leaf out-lpi-time {
  type decimal64 {
    fraction-digits 6;
  }
  units seconds;
  description
  "A count reflecting the total amount of time (in
  seconds) that the LPI_INDICATION parameter has the
  value ASSERT. The request is indicated to the PHY
according to the requirements of the RS (see IEEE 802.3, 22.7, 35.4, and 46.4).

Also see the 'description' statement associated with the parent 'phy-statistics' container for additional common semantics related to this counter.

reference
"IEEE Std 802.3, 30.3.2.1.8 aTransmitLPIMicroseconds";
}
}
}
}
}
container mac-control {
  description
  "A group of statistics specific to MAC Control operation of selected Ethernet interfaces.

  Discontinuities in the values of counters in the container can occur at re-initialization of the management system, and at other times as indicated by the value of the 'discontinuity-time' leaf defined in the ietf-interfaces YANG module (IETF RFC 8343).";

  reference  
  "IEEE Std 802.3.1, dot3ExtensionTable";
}
leaf in-frames-mac-control-unknown {
  type yang:counter64;
  units frames;
  description
  "A count of MAC Control frames with an unsupported opcode received on this Ethernet interface.

  Frames counted against this counter are also counted against in-discards defined in the ietf-interfaces YANG module (IETF RFC 8343).

  Also see the 'description' statement associated with the parent 'mac-control-statistics' container for additional semantics.";
  reference 
  "IEEE Std 802.3, 30.3.3.5 aUnsupportedOpcodesReceived";
}
leaf in-frames-mac-control-extension {
  type yang:counter64;
  units frames;
  description
  "The count of Extension MAC Control frames received on this Ethernet interface.

  Also see the 'description' statement associated with the parent 'mac-control-statistics' container for
additional semantics.

reference
"IEEE Std 802.3, 30.3.8.2
aEXTENSIONMACCtrlFramesReceived";

leaf out-frames-mac-control-extension {
  type yang:counter64;
  units frames;
  description
  "The count of Extension MAC Control frames transmitted
  on this Ethernet interface.

  Also see the 'description' statement associated with
  the parent 'mac-control-statistics' container for
  additional semantics.";
  reference
  "IEEE Std 802.3, 30.3.8.1
  a EXTENSIONMACCtrlFramesTransmitted";
}

5.3.2.2 Ethernet interface module (half-duplex)

module ieee802-ethernet-interface-half-duplex {
  yang-version 1.1;
  namespace
    "urn:ieee:std:802.3:yang:ieee802-ethernet-interface-half-duplex";
  prefix ieee802-eth-half-duplex;
  revision 2019-06-21 {
    description "Initial revision.";
  }
  import ietf-yang-types {
    prefix yang;
    reference "IETF RFC 6991";
  }
  import ietf-interfaces {
    prefix if;
    reference "IETF RFC 8343";
  }
  import iana-if-type {
    prefix ianaift;
    reference "http://www.iana.org/assignments/yang-parameters/
      iana-if-type@2018-07-03.yang";
  }
}
import ieee802-ethernet-interface {
    prefix ieee802-eth-if;
}

organization
  "IEEE Std 802.3 Ethernet Working Group
  Web URL: http://www.ieee802.org/3/";

contact
  "Web URL: http://www.ieee802.org/3/";

description
  "This module contains YANG definitions for configuring Ethernet
  interfaces that are deprecated, and are no longer
  widely used in the industry. The definitions are maintained for
  backwards compatibility purposes, but the general expectation is
  that this module is not anticipated to be widely implemented."
reference
  "IEEE Std 802.3-2018, unless dated explicitly";

feature dynamic-rate-control {
    description
        "This feature indicates that the device supports Ethernet
        interfaces lowering the average data rate of the MAC sublayer,
        with frame granularity, by using Rate Control to dynamically
        increase the inter-packet gap for some types of Ethernet
        interface.
        Only valid for Ethernet interfaces operating at speeds (data rates)
        above 1000 Mb/s.";
    reference "IEEE Std 802.3, 30.3.1.1.33 aRateControlAbility";
}

feature csma-cd {
    description
        "This feature indicates that the device supports Ethernet
        interfaces running at half-duplex using CSMA/CD."
}

typedef dynamic-rate-control-type {
    type enumeration {
        enum disabled {
            description
                "Dynamic rate control is disabled";
        }
        enum "sonet-oc192" {
            value 2;
            description
                "Dynamic rate control is enabled for a 10 Gb/s Ethernet
                interface to SONET/SDH OC192/STM64.";
        }
    }
    default disabled;
    description
        "Allowed values for dynamic-rate-control."
    reference
        "IEEE Std 802.3, 4.4.2 ipgStretchRatio and 30.3.1.1.34
        aRateControlStatus";
augment "/if:interfaces/if:interface/ieee802-eth-if:ethernet" {
  when "derived-from-or-self{../../if:type, 'ianaift:ethernetCsmacd')
  and ieee802-eth-if:duplex = 'half'" {
    description
    "Applies to half-duplex Ethernet interfaces.";
  }
}

description
"Augment with Ethernet interface configuration parameters
for half-duplex operation.";

leaf dynamic-rate-control {
  if-feature "dynamic-rate-control";
  type dynamic-rate-control-type;
  description
  "Enables dynamic rate control and specifies what speed (data rate)
  the dynamic rate control is operating at. The value of this attribute
  is constrained by the MAC data rate and hardware support.
  The default value is implementation-dependent.";
  reference
  "IEEE Std 802.3, 30.3.1.1.34 aRateControlStatus";
}

augment "/if:interfaces/if:interface/ieee802-eth-if:ethernet/" +
"/ieee802-eth-if:capabilities"{
  when "derived-from-or-self{../../if:type,
  'ianaift:ethernetCsmacd') and ../../ieee802-eth-if:duplex = 'half'" {
    description "Applies to half-duplex Ethernet interfaces";
  }
}

description
"Augment with configuration capabilities for half-duplex
Ethernet interface.";

leaf dynamic-rate-control-supported {
  if-feature "dynamic-rate-control";
  type boolean;
  default false;
  description
  "Indicates whether the Ethernet interface supports lowering
  the average data rate of the MAC sublayer, with frame
  granularity, by using Rate Control to dynamically increase
  the inter-packet gap.
  Only valid for Ethernet interfaces operating at speeds (data rates)
  above 1000 Mb/s.";
  reference
  "IEEE Std 802.3, 30.3.1.1.33 aRateControlAbility";
}

augment "/if:interfaces/if:interface/ieee802-eth-if:ethernet/" +
"/ieee802-eth-if:statistics/ieee802-eth-if:frame" {
  when "derived-from-or-self{../../../../if:type,
  'ianaift:ethernetCsmacd') and ../../../../ieee802-eth-if:duplex = 'half'" {
    description
    "Applies to half-duplex Ethernet interfaces.";
}
} 

description 
"Augment with statistics for half-duplex Ethernet interface.";

container "csma-cd" {
  if-feature "csma-cd";
  description 
  "Holds counters that are specific to CDMA/CD half-duplex 
  operation of Ethernet interfaces. 
  Discontinuities in the values of the counters in this 
  container can occur at re-initialization of the management 
  system, and at other times as indicated by the value of the 
  'discontinuity-time' leaf defined in the ietf-interfaces 
  YANG module (IETF RFC 8343).";

  leaf in-errors-sqe-test {
    type yang:counter64;
    units errors;
    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, 7.2.4.6. 
    This counter does not increment on Ethernet interfaces 
    operating at speeds (data rates) greater than 10 Mb/s, or on 
    Ethernet 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 the 
    'discontinuity-time' leaf defined in the ietf-interfaces 
    YANG module (IETF RFC 8343).";
    reference 
    "IEEE Std 802.3, 7.2.4.6, and 30.3.2.1.4 aSQETestErrors";
  }

  leaf out-frames-collision-single {
    type yang:counter64;
    units frames;
    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 
    'out-unicast-frames', 'out-broadcast-frames', or 
    'out-multicast-frames', and is not counted by the 
    corresponding instance of the 
    'out-frames-collision-multiple'. 
    This counter does not increment when the Ethernet 
    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 the 
    'discontinuity-time' leaf defined in the ietf-interfaces 
    YANG module (IETF RFC 8343).";
    reference 
    "IEEE Std 802.3, 30.3.1.1.3 aSingleCollisionFrames";
  }
}
leaf out-frames-collision-multiple {
  type yang:counter64;
  units frames;
  description
  "A count of frames that are involved in multiple
  collisions, 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 'out-unicast-frames', 'out-broadcast-frames', or
  'out-multicast-frames', and is not counted by the
  corresponding instance of the 'out-frames-collision-single'.
  This counter does not increment when the Ethernet
  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 the
  'discontinuity-time' leaf defined in the ietf-interfaces
  YANG module (IETF RFC 8343).";
  reference
  "IEEE Std 802.3, 30.3.1.1.4 aMultipleCollisionFrames";
}

leaf out-frames-deferred {
  type yang:counter64;
  units frames;
  description
  "A count of frames for which the first transmission attempt
  on a particular Ethernet interface is delayed because the
  medium is busy.
  A deferred frame that is not subject to any number of
  collisions is not counted by an instance of
  'out-frames-collision-single' or
  'out-frames-collision-multiple' objects.
  This counter does not increment when the Ethernet
  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 the
  'discontinuity-time' leaf defined in the ietf-interfaces
  YANG module (IETF RFC 8343).";
  reference
  "IEEE Std 802.3, 30.3.1.1.9 aFramesWithDeferredXmissions";
}

leaf out-frames-collisions-excessive {
  type yang:counter64;
  units frames;
  description
  "A count of frames for which transmission on a particular
  Ethernet interface fails due to excessive collisions.
  This counter does not increment when the Ethernet
  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 the
  'discontinuity-time' leaf defined in the ietf-interfaces
  YANG module (IETF RFC 8343).";
leaf out-collisions-late {
    type yang:counter64;
    units collisions;
    description
        "The number of times that a collision is detected on a
        particular Ethernet 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 Ethernet
        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 the
        'discontinuity-time' leaf defined in the ietf-interfaces
        YANG module (IETF RFC 8343).";
    reference
        "IEEE Std 802.3, 30.3.1.1.10 aLateCollisions";
}

leaf out-errors-carrier-sense {
    type yang:counter64;
    units errors;
    description
        "The number of times that the carrier sense condition was
        lost or never asserted when attempting to transmit a frame
        on a particular Ethernet 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 Ethernet
        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 the
        'discontinuity-time' leaf defined in the ietf-interfaces
        YANG module (IETF RFC 8343).";
    reference
        "IEEE Std 802.3, 30.3.1.1.13 aCarrierSenseErrors";
}

list collision-histogram {
    key collision-count;
    description
        "A collection of collision histograms for a particular
        interface.";
    reference
        "IEEE Std 802.3, 30.3.1.1.30 aCollisionFrames";
    leaf collision-count {
        type yang:counter64;
        units collisions;
        description

"The number of per-frame media collisions for which a particular collision histogram cell represents the frequency on a particular interface."

leaf collision-count-frames {
  type yang:counter64;
  units frames;
  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 an interface after experiencing exactly 4 collisions would be indicated by incrementing only collision-count-frames object associated with the collision-count value of 4. No other instance of collision-count-frames 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 the 'discontinuity-time' leaf defined in the ietf-interfaces YANG module (IETF RFC 8343).\";
}