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K. S. Teow
Brocade Communications Systems, Inc.

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Definitions of Managed Objects for the Fabric Element in Fibre Channel Standard

Status of this Memo

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Abstract

This memo defines an extension to the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines the objects for managing the operations of the Fabric Element portion of the Fibre Channel Standards.

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [1].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in STD 58, RFC 2578 [5], STD 58, RFC 2579 [6] and STD 58, RFC 2580 [7].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- o A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [16].

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

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

2. Overview

A Fibre Channel Fabric is an entity which interconnects Node Ports (N_Ports) or Node Loop Ports (NL_Ports). It provides transport and routing functions. In essence, a Fabric is a network of N_Ports and/or NL_Ports to communicate with one another. A Fabric is composed of one or more Fabric Element that are interconnected via Inter-element Links (IEL). A Fabric Element is the smallest unit of a Fabric that meets the definition of a Fabric. It must consist of at least three external ports to connect to either N_Ports, NL_Ports or other Fabric Elements. In general, a Fabric Element port may be of one of the following types:

(1) F_Port, a fabric port to connect to an N_Port ([17], [21], [22]);

(2) FL_Port, a fabric port that also supports a FC Arbitrated Loop consisting of one or more NL_Ports ([20], [24]).

(3) E_Port, an expansion port to connect to another Fabric Element ([18], [23]);

This memo shall define objects related to a Fabric Element, its F_Ports and FL_Ports. Objects related to other types of FC ports shall be defined in future.

For the rest of the document, the term, "FxPort", will be used to refer to both F_Port and FL_Port where the distinction is not necessary. The term, "NxPort" will be used to refer to both N_Port and NL_Port in the similar fashion.

2.1. Management View of a Fabric Element

From the management perspective, it is helpful to view a Fabric Element to be consisting of multiple "modules". Each module is a grouping, either physical or logical, of one or more ports that may be managed as a sub-entity within the Fabric Element.

This module mapping is recommended but optional. A vendor may elect to put all ports into a single module, or to divide the ports into modules that do not match physical divisions.

The object fcFeModuleCapacity indicates the maximum number of modules that a given Fabric Element may contain. This value must remain constant from one management restart to the next.

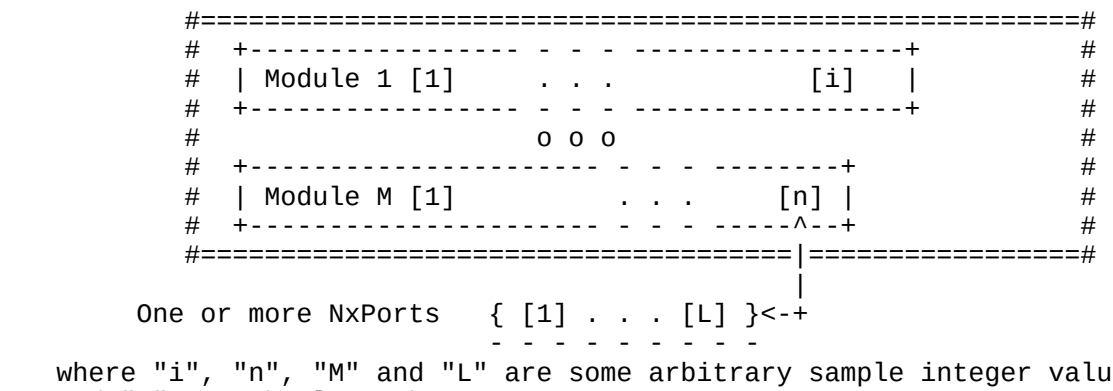
Each module is uniquely identified by a module number in the range of 1 through fcFeModuleCapacity inclusive. Modules may come and go without causing a management reset (of sysUpTime), and may be sparsely numbered within the Fabric Element. That is, the module numbering is not required to be contiguous. For instance, if a module is mapped physically to a field-replaceable card and in a 13-card cage Fabric Element, cards 3, 5, 6 and 7 may be installed. The vendor may choose to label them as modules 3, 5, 6 and 7 respectively. In this example, the value of fcFeModuleCapacity is 13. Note that the object fcFeModuleLastChange acts as the discontinuity indicator for all counter objects in this MIB.

A Fabric Element may also provide a proxy management on behalf of another management entity by presenting it as one of its Fabric Element modules.

The object fcFeModuleFxPortCapacity indicates the maximum number of ports that a given module may contain. The value of fcFeModuleFxPortCapacity must not change for a given module. However, a module may be deleted from the Fabric Element and replaced with a module containing a different number of ports. The value of fcFeModuleLastChange will indicate that a change took place.

Each port within the Fabric Element is uniquely identified by a combination of module index and port index, where port index is an integer in the range (1..fcFeModuleFxPortCapacity). As with modules within a Fabric Element, ports within a module may be sparsely numbered. That is the port numbering is not required to be contiguous. Likewise, ports may come and go within a module without causing a management reset.

In terms of attachment, an F_Port will be attached to another N_Port; and an FL_Port will be attached to one or up to 126 NL_Ports. In general, an FxPort may be attached to one or more NxPorts. Each NxPort associated with an FxPort will be uniquely identified by a combination of module index, FxPort index and NxPort index. An NxPort index is an integer in the range (1..126). The following diagram illustrates the management view of a Fabric Element.



where "i", "n", "M" and "L" are some arbitrary sample integer values, and "L" must be less than 127.

2.2. Structure of the Fabric Element MIB

This memo assumes that a Fabric Element has an SNMP entity associated with its managed objects. The managed objects are divided as follow:

- the Configuration group
- the Status group
- the Error group
- the Accounting group
- the Capability group

In each group, scalar objects and table entries are defined.

The Configuration group contains configuration and service parameters for the Fabric Element, modules and the FxPorts.

The Operation group contains the operational status and parameters of an FxPort. The group also contains the service parameters that have been established between the FxPort and its attached NxPort, if applicable.

The Error group contains counters tracking various types of errors detected by each FxPort. The information may be used for diagnostics and/or to derive the quality of the link between an FxPort and one or more attached NxPorts.

The Accounting group contains statistic data suitable for deriving accounting and performance information.

The Capability group contains parameters indicating the inherent capability of the Fabric Element and each FxPort.

3. Object Definitions

```
FIBRE-CHANNEL-FE-MIB DEFINITIONS ::= BEGIN
  IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE,
    Unsigned32, Counter32, Gauge32, Integer32, mib-2
      FROM SNMPv2-SMI
    TEXTUAL-CONVENTION, TruthValue, TimeStamp
      FROM SNMPv2-TC
    SnmpAdminString
      FROM SNMP-FRAMEWORK-MIB                    -- rfc2571
    MODULE-COMPLIANCE, OBJECT-GROUP
      FROM SNMPv2-CONF;

  fcFeMIB MODULE-IDENTITY
    LAST-UPDATED "200005180000Z"
    ORGANIZATION "IETF IPFC Working Group"
    CONTACT-INFO "Kha Sin Teow
                  Brocade Communications Systems,
                  1901 Guadalupe Parkway,
                  San Jose, CA 95131
                  U.S.A
                  Tel: +1 408 487 8180
                  Fax: +1 408 487 8190
                  Email: khasin@Brocade.COM

                 WG Mailing list:ipfc@standards.gadzoox.com
                 To Subscribe: ipfc-request@standards.gadzoox.com
                 In Body: subscribe"

    DESCRIPTION "The MIB module for Fibre Channel Fabric Element."
    REVISION "200005180000Z"
    DESCRIPTION "Initial revision, published as RFC 2837."
    ::= { mib-2 75 }

  fcFeMIBObjects OBJECT IDENTIFIER ::= { fcFeMIB 1 }

   --  Note:
   --  fcFeMIBConformance OBJECT IDENTIFIER ::= { fcFeMIB 2 }
   --  see at the end of the module

  -- Groups under fcFeMIBObjects
```

```
  fcFeConfig       OBJECT IDENTIFIER ::= { fcFeMIBObjects 1 }
  fcFeStatus       OBJECT IDENTIFIER ::= { fcFeMIBObjects 2 }
  fcFeError        OBJECT IDENTIFIER ::= { fcFeMIBObjects 3 }
  fcFeAccounting   OBJECT IDENTIFIER ::= { fcFeMIBObjects 4 }
  fcFeCapabilities OBJECT IDENTIFIER ::= { fcFeMIBObjects 5 }

  -- Textual Conventions
  MilliSeconds ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents time unit value in milliseconds."
    SYNTAX         Unsigned32

  MicroSeconds ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents time unit value in microseconds."
    SYNTAX         Unsigned32

  FcNameId ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents the Worldwide Name associated with
                    a Fibre Channel (FC) entity."
    SYNTAX         OCTET STRING (SIZE (8))

  FcAddressId ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents Fibre Channel Address ID, a 24-bit
                    value unique within the address space of a Fabric."
    SYNTAX         OCTET STRING (SIZE (3))

  FcRxDataFieldSize ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents the receive data field size of an
                    NxPort or FxPort."
    SYNTAX         Integer32 (128..2112)

  FcBbCredit ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents the buffer-to-buffer credit of an
                    NxPort or FxPort."
    SYNTAX         Integer32 (0..32767)

  FcphVersion ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents the version of FC-PH supported by an
                    NxPort or FxPort."
    SYNTAX         Integer32 (0..255)

  FcStackedConnMode ::= TEXTUAL-CONVENTION
```

```
    STATUS          current
    DESCRIPTION     "Represents an enumerated value used to indicate
                     the Class 1 Stacked Connect Mode supported by
                     an NxPort or FxPort."
    SYNTAX          INTEGER {
                         none(1),
                         transparent(2),
                         lockedDown(3)
    }

  FcCosCap ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the class of service capability of an
                     NxPort or FxPort."
    SYNTAX          BITS { classF(0), class1(1), class2(2), class3(3),
                           class4(4), class5(5), class6(6) }

  FcFeModuleCapacity ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the maximum number of modules within
                     a Fabric Element."
    SYNTAX          Unsigned32

  FcFeFxPortCapacity ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the maximum number of FxPorts within
                     a module."
    SYNTAX          Unsigned32

  FcFeModuleIndex ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the module index within a conceptual table."
    SYNTAX          Unsigned32

  FcFeFxPortIndex ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the FxPort index within a conceptual table."
    SYNTAX          Unsigned32

  FcFeNxPortIndex ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the NxPort index within a conceptual table."
    SYNTAX          Integer32 (1..126)

  FcBbCreditModel ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION     "Represents the BB_Credit model of an FxPort."
    SYNTAX          INTEGER { regular(1), alternate (2) }
```

```
  -- The Configuration group

  -- This group consists of scalar objects and tables.
  -- It contains the configuration and service parameters
  -- of the Fabric Element and the FxPorts.
  -- The group represents a set of parameters associated with
  -- the Fabric Element  or an FxPort to support its NxPorts.

  fcFeFabricName OBJECT-TYPE
      SYNTAX      FcNameId
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "The Name_Identifier of the Fabric to which this Fabric
          Element belongs."
  ::= { fcFeConfig 1 }

  fcFeElementName OBJECT-TYPE
      SYNTAX      FcNameId
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "The Name_Identifier of the Fabric Element."
  ::= { fcFeConfig 2 }

  fcFeModuleCapacity OBJECT-TYPE
      SYNTAX      FcFeModuleCapacity
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The maximum number of modules in the Fabric Element,
          regardless of their current state."
  ::= { fcFeConfig 3 }

  -- The Module Table.
  -- This table contains one entry for each module,
  -- information of the modules.

  fcFeModuleTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFeModuleEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each module in the
          Fabric Element, information of the modules."
  ::= { fcFeConfig 4 }

  fcFeModuleEntry OBJECT-TYPE
```

```
      SYNTAX      FcFeModuleEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing the configuration parameters of a
          module."
      INDEX { fcFeModuleIndex }
  ::= { fcFeModuleTable 1 }


  FcFeModuleEntry ::=
      SEQUENCE {
          fcFeModuleIndex
              FcFeModuleIndex,
          fcFeModuleDescr
              SnmpAdminString,
          fcFeModuleObjectID
              OBJECT IDENTIFIER,
          fcFeModuleOperStatus
              INTEGER,
          fcFeModuleLastChange
              TimeStamp,
          fcFeModuleFxPortCapacity
              FcFeFxPortCapacity,
          fcFeModuleName
              FcNameId
      }

  fcFeModuleIndex OBJECT-TYPE
      SYNTAX      FcFeModuleIndex
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "This object identifies the module within the Fabric Element
          for which this entry contains information. This value is
          never greater than fcFeModuleCapacity."
  ::= { fcFeModuleEntry 1 }

  fcFeModuleDescr OBJECT-TYPE
      SYNTAX      SnmpAdminString
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A textual description of the module. This value should
          include the full name and version identification of the
          module."
  ::= { fcFeModuleEntry 2 }
```

```
  fcFeModuleObjectID OBJECT-TYPE
      SYNTAX      OBJECT IDENTIFIER
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The vendor's authoritative identification of the module.
          This value may be allocated within the SMI enterprises
          subtree (1.3.6.1.4.1) and provides a straight-forward and
          unambiguous means for determining what kind of module is
          being managed.

          For example, this object could take the value
          1.3.6.1.4.1.99649.3.9 if vendor 'Neufe Inc.' was assigned
          the subtree 1.3.6.1.4.1.99649, and had assigned the
          identifier 1.3.6.1.4.1.99649.3.9 to its 'FeFiFo-16
          PlugInCard.'"
  ::= { fcFeModuleEntry 3 }

  fcFeModuleOperStatus    OBJECT-TYPE
      SYNTAX      INTEGER {
                      online  (1), -- functional
                      offline (2), -- not available
                      testing (3), -- under testing
                      faulty  (4)  -- defective
                  }
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "This object indicates the operational status of the module:
          online(1)   the module is functioning properly;
          offline(2)  the module is not available;
          testing(3)  the module is under testing; and
          faulty(4)   the module is defective in some way."
  ::= { fcFeModuleEntry 4 }

  fcFeModuleLastChange OBJECT-TYPE
      SYNTAX      TimeStamp
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "This object contains the value of sysUpTime when the module
          entered its current operational status. A value of zero
          indicates that the operational status of the module has not
          changed since the agent last restarted."
  ::= { fcFeModuleEntry 5 }

  fcFeModuleFxPortCapacity OBJECT-TYPE
      SYNTAX      FcFeFxPortCapacity
```

```
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of FxPort that can be contained within the
          module. Within each module, the ports are uniquely numbered
          in the range from 1 to fcFeModuleFxPortCapacity inclusive.
          However, the numbers are not required to be contiguous."
  ::= { fcFeModuleEntry 6 }

  fcFeModuleName OBJECT-TYPE
      SYNTAX      FcNameId
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "The Name_Identifier of the module."
  ::= { fcFeModuleEntry 7 }

  -- the FxPort Configuration Table.
  -- This table contains, one entry for each FxPort,
  -- configuration parameters of the ports.

 fcFxPortTable OBJECT-TYPE
     SYNTAX      SEQUENCE OF FcFxPortEntry
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
        "A table that contains, one entry for each FxPort in the
         Fabric Element, configuration and service parameters of the
         FxPorts."
 ::= { fcFeConfig 5 }

 fcFxPortEntry OBJECT-TYPE
     SYNTAX      FcFxPortEntry
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
        "An entry containing the configuration and service parameters
         of a FxPort."
     INDEX { fcFeModuleIndex, fcFxPortIndex }
 ::= { fcFxPortTable 1 }


 FcFxPortEntry ::=
     SEQUENCE {
         fcFxPortIndex
             FcFeFxPortIndex,
         fcFxPortName
             FcNameId,
```

```
        -- FxPort common service parameters
        fcFxPortFcphVersionHigh
            FcphVersion,
        fcFxPortFcphVersionLow
            FcphVersion,
        fcFxPortBbCredit
            FcBbCredit,
        fcFxPortRxBufSize
            FcRxDataFieldSize,
        fcFxPortRatov
            MilliSeconds,
        fcFxPortEdtov
            MilliSeconds,
        -- FxPort class service parameters
        fcFxPortCosSupported
            FcCosCap,
        fcFxPortIntermixSupported
            TruthValue,
        fcFxPortStackedConnMode
            FcStackedConnMode,
        fcFxPortClass2SeqDeliv
            TruthValue,
        fcFxPortClass3SeqDeliv
            TruthValue,
        -- other configuration parameters
        fcFxPortHoldTime
            MicroSeconds
    }

  fcFxPortIndex OBJECT-TYPE
      SYNTAX      FcFeFxPortIndex
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "This object identifies the FxPort within the module.  This
           number ranges from 1 to the value of fcFeModulePortCapacity
           for the associated module. The value remains constant for
           the identified FxPort until the module is re-initialized."
  ::= { fcFxPortEntry 1 }

  fcFxPortName OBJECT-TYPE
      SYNTAX      FcNameId
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The World_wide Name of this FxPort.  Each FxPort has a
           unique Port World_wide Name within the Fabric."
  ::= { fcFxPortEntry 2 }
```

```
  -- FxPort common service parameters

  fcFxPortFcphVersionHigh OBJECT-TYPE
      SYNTAX      FcphVersion
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The highest or most recent version of FC-PH that the FxPort
          is configured to support."
  ::= { fcFxPortEntry 3 }

  fcFxPortFcphVersionLow OBJECT-TYPE
      SYNTAX      FcphVersion
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The lowest or earliest version of FC-PH that the FxPort is
          configured to support."
  ::= { fcFxPortEntry 4 }

  fcFxPortBbCredit OBJECT-TYPE
      SYNTAX      FcBbCredit
      UNITS       "buffers"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The total number of receive buffers available for holding
          Class 1 connect-request, Class 2 or 3 frames from the
          attached NxPort.  It is for buffer-to-buffer flow control
          in the direction from the attached NxPort (if applicable)
          to FxPort."
      ::= { fcFxPortEntry 5 }

  fcFxPortRxBufSize OBJECT-TYPE
      SYNTAX      FcRxDataFieldSize
      UNITS       "bytes"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The largest Data_Field Size (in octets) for an FT_1 frame
          that can be received by the FxPort."
  ::= { fcFxPortEntry 6 }

  fcFxPortRatov OBJECT-TYPE
      SYNTAX      MilliSeconds
      UNITS       "milliseconds"
      MAX-ACCESS  read-only
      STATUS      current
```

```
      DESCRIPTION
         "The Resource_Allocation_Timeout Value configured for the
          FxPort.  This is used as the timeout value for determining
          when to reuse an NxPort resource such as a
          Recovery_Qualifier.  It represents E_D_TOV (see next
          object) plus twice the maximum time that a frame may be
          delayed within the Fabric and still be delivered."
      ::= { fcFxPortEntry 7 }

  fcFxPortEdtov OBJECT-TYPE
      SYNTAX      MilliSeconds
      UNITS       "milliseconds"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The E_D_TOV value configured for the FxPort. The
          Error_Detect_Timeout Value is used as the timeout value for
          detecting an error condition."
  ::= { fcFxPortEntry 8 }


  -- FxPort class service parameters

  fcFxPortCosSupported OBJECT-TYPE
      SYNTAX      FcCosCap
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A value indicating the set of Classes of Service supported
          by the FxPort."
  ::= { fcFxPortEntry 9 }

  fcFxPortIntermixSupported OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A flag indicating whether or not the FxPort supports an
          Intermixed Dedicated Connection."
  ::= { fcFxPortEntry 10 }

  fcFxPortStackedConnMode OBJECT-TYPE
      SYNTAX      FcStackedConnMode
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A value indicating the mode of Stacked Connect supported by
          the FxPort."
```

```
  ::= { fcFxPortEntry 11 }

  fcFxPortClass2SeqDeliv OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A flag indicating whether or not Class 2 Sequential
          Delivery is supported by the FxPort."
  ::= { fcFxPortEntry 12 }

  fcFxPortClass3SeqDeliv OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A flag indicating whether or not Class 3 Sequential
          Delivery is supported by the FxPort."
  ::= { fcFxPortEntry 13 }


  -- other FxPort parameters

  fcFxPortHoldTime OBJECT-TYPE
      SYNTAX      MicroSeconds
      UNITS       "microseconds"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The maximum time (in microseconds) that the FxPort shall
          hold a frame before discarding the frame if it is unable to
          deliver the frame. The value 0 means that the FxPort does
          not support this parameter."
  ::= { fcFxPortEntry 14 }


  -- the Status group

  -- This group consists of tables that contains operational
  -- status and established service parameters for the Fabric
  -- Element and the attached NxPorts.

  -- The FxPort Status table
  -- This table contains, one entry for each FxPort,
  -- the operational status and parameters of the FxPorts.

  fcFxPortStatusTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortStatusEntry
```

```
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort in the
          Fabric Element, operational status and parameters of the
          FxPorts."
  ::= { fcFeStatus 1 }

  fcFxPortStatusEntry OBJECT-TYPE
      SYNTAX      FcFxPortStatusEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing operational status and parameters of a
          FxPort."
      AUGMENTS { fcFxPortEntry }
  ::= { fcFxPortStatusTable 1 }


  FcFxPortStatusEntry ::=
      SEQUENCE {
          fcFxPortID
              FcAddressId,
          fcFxPortBbCreditAvailable
              Gauge32,
          fcFxPortOperMode
              INTEGER,
          fcFxPortAdminMode
              INTEGER
      }

  fcFxPortID   OBJECT-TYPE
      SYNTAX      FcAddressId
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The address identifier by which this FxPort is identified
          within the Fabric.  The FxPort may assign its address
          identifier to its attached NxPort(s) during Fabric Login."
  ::= { fcFxPortStatusEntry 1 }

  fcFxPortBbCreditAvailable OBJECT-TYPE
      SYNTAX      Gauge32
      UNITS       "buffers"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of buffers currently available for receiving
```

```
          frames from the attached port in the buffer-to-buffer flow
          control. The value should be less than or equal to
          fcFxPortBbCredit."
  ::= { fcFxPortStatusEntry 2 }

  fcFxPortOperMode    OBJECT-TYPE
      SYNTAX              INTEGER { unknown(1), fPort(2), flPort(3) }
      MAX-ACCESS          read-only
      STATUS              current
      DESCRIPTION
         "The current operational mode of the FxPort."
  ::= { fcFxPortStatusEntry 3 }

  fcFxPortAdminMode   OBJECT-TYPE
      SYNTAX              INTEGER { fPort(2), flPort(3) }
      MAX-ACCESS          read-write
      STATUS              current
      DESCRIPTION
         "The desired operational mode of the FxPort."
  ::= { fcFxPortStatusEntry 4 }


  -- the FxPort Physical Level table
  -- This table contains, one entry for each FxPort in the
  -- Fabric Element, the physical level status and parameters
  -- of the FxPorts.

  fcFxPortPhysTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortPhysEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort in the
          Fabric Element, physical level status and parameters of the
          FxPorts."
  ::= { fcFeStatus 2 }

  fcFxPortPhysEntry OBJECT-TYPE
      SYNTAX      FcFxPortPhysEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing physical level status and parameters of
          a FxPort."
      AUGMENTS { fcFxPortEntry }
  ::= { fcFxPortPhysTable 1 }

  FcFxPortPhysEntry ::=
```

```
      SEQUENCE {
          fcFxPortPhysAdminStatus
              INTEGER,
          fcFxPortPhysOperStatus
              INTEGER,
          fcFxPortPhysLastChange
              TimeStamp,
          fcFxPortPhysRttov
              MilliSeconds
      }

  fcFxPortPhysAdminStatus OBJECT-TYPE
      SYNTAX      INTEGER {
                      online  (1),  -- place port online
                      offline (2),  -- take port offline
                      testing (3)   -- initiate test procedures
                  }
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "The desired state of the FxPort.  A management station may
          place the FxPort in a desired state by setting this object
          accordingly.  The testing(3) state indicates that no
          operational frames can be passed.  When a Fabric Element
          initializes, all FxPorts start with fcFxPortPhysAdminStatus
          in the offline(2) state.  As the result of either explicit
          management action or per configuration information
          accessible by the Fabric Element, fcFxPortPhysAdminStatus
          is then changed to either the online(1) or testing(3)
          states, or remains in the offline state."
  ::= { fcFxPortPhysEntry 1 }

  fcFxPortPhysOperStatus   OBJECT-TYPE
      SYNTAX      INTEGER {
          online       (1), -- Login may proceed
          offline      (2), -- Login cannot proceed
          testing      (3), -- port is under test
          linkFailure  (4)  -- failure after online/testing
      }
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The current operational status of the FxPort.  The
          testing(3) indicates that no operational frames can be
          passed.  If fcFxPortPhysAdminStatus is offline(2) then
          fcFxPortPhysOperStatus should be offline(2). If
          fcFxPortPhysAdminStatus is changed to online(1) then
          fcFxPortPhysOperStatus should change to online(1) if the
```

```
          FxPort is ready to accept Fabric Login request from the
          attached NxPort; it should proceed and remain in the link-
          failure(4) state if and only if there is a fault that
          prevents it from going to the online(1) state."
  ::= { fcFxPortPhysEntry 2 }

  fcFxPortPhysLastChange OBJECT-TYPE
      SYNTAX      TimeStamp
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The value of sysUpTime at the time the FxPort entered its
          current operational status. A value of zero indicates that
          the FxPort's operational status has not changed since the
          agent last restarted."
  ::= { fcFxPortPhysEntry 3 }

  fcFxPortPhysRttov OBJECT-TYPE
      SYNTAX      MilliSeconds
      UNITS       "milliseconds"
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "The Receiver_Transmitter_Timeout value of the FxPort. This
          is used by the receiver logic to detect Loss of
          Synchronization."
  ::= { fcFxPortPhysEntry 4 }

  -- The FxPort Fabric Login table
  --
  -- This table contains, one entry for each FxPort in the
  -- Fabric Element, the Service Parameters that have been
  -- established from the most recent Fabric Login,
  -- implicit or explicit.

  fcFxLoginTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxLoginEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each NxPort attached
          to a particular FxPort in the Fabric Element, services
          parameters established from the most recent Fabric Login,
          explicit or implicit. Note that an FxPort may have one or
          more NxPort attached to it."
  ::= { fcFeStatus 3 }
```

```
  fcFxLoginEntry OBJECT-TYPE
      SYNTAX      FcFxLoginEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing service parameters established from a
          successful Fabric Login."
      INDEX { fcFeModuleIndex, fcFxPortIndex, fcFxPortNxLoginIndex }
  ::= { fcFxLoginTable 1 }

  FcFxLoginEntry ::=
      SEQUENCE {
          fcFxPortNxLoginIndex
              FcFeNxPortIndex,
          fcFxPortFcphVersionAgreed
              FcphVersion,
          fcFxPortNxPortBbCredit
              FcBbCredit,
          fcFxPortNxPortRxDataFieldSize
              FcRxDataFieldSize,
          fcFxPortCosSuppAgreed
              FcCosCap,
          fcFxPortIntermixSuppAgreed
              TruthValue,
          fcFxPortStackedConnModeAgreed
              FcStackedConnMode,
          fcFxPortClass2SeqDelivAgreed
              TruthValue,
          fcFxPortClass3SeqDelivAgreed
              TruthValue,
          --
          fcFxPortNxPortName
              FcNameId,
          fcFxPortConnectedNxPort
              FcAddressId,
          fcFxPortBbCreditModel
              FcBbCreditModel
      }

  fcFxPortNxLoginIndex OBJECT-TYPE
      SYNTAX      FcFeNxPortIndex
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "The object identifies the associated NxPort in the
          attachment for which the entry contains information."
  ::= { fcFxLoginEntry 1 }
```

```
  fcFxPortFcphVersionAgreed OBJECT-TYPE
      SYNTAX      FcphVersion
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The version of FC-PH that the FxPort has agreed to support
          from the Fabric Login"
  ::= { fcFxLoginEntry 2 }

  fcFxPortNxPortBbCredit OBJECT-TYPE
      SYNTAX      FcBbCredit
      UNITS       "buffers"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The total number of buffers available for holding Class 1
          connect-request, Class 2 or Class 3 frames to be
          transmitted to the attached NxPort.  It is for buffer-to-
          buffer flow control in the direction from FxPort to NxPort.
          The buffer-to-buffer flow control mechanism is indicated in
          the respective fcFxPortBbCreditModel."
  ::= { fcFxLoginEntry 3 }

  fcFxPortNxPortRxDataFieldSize OBJECT-TYPE
      SYNTAX      FcRxDataFieldSize
      UNITS       "bytes"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The Receive Data Field Size of the attached NxPort. This
          object specifies the largest Data Field Size for an FT_1
          frame that can be received by the NxPort."
  ::= { fcFxLoginEntry 4 }

  fcFxPortCosSuppAgreed OBJECT-TYPE
      SYNTAX      FcCosCap
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A variable indicating that the attached NxPort has
          requested the FxPort for the support of classes of services
          and the FxPort has granted the request."
  ::= { fcFxLoginEntry 5 }

  fcFxPortIntermixSuppAgreed OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
```

```
      DESCRIPTION
         "A variable indicating that the attached NxPort has
          requested the FxPort for the support of Intermix and the
          FxPort has granted the request. This flag is only valid if
          Class 1 service is supported."
  ::= { fcFxLoginEntry 6 }

  fcFxPortStackedConnModeAgreed OBJECT-TYPE
      SYNTAX      FcStackedConnMode
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A variable indicating whether the FxPort has agreed to
          support stacked connect from the Fabric Login. This is only
          meaningful if Class 1 service has been agreed."
  ::= { fcFxLoginEntry 7 }

  fcFxPortClass2SeqDelivAgreed OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A variable indicating whether the FxPort has agreed to
          support Class 2 sequential delivery from the Fabric Login.
          This is only meaningful if Class 2 service has been
          agreed."
  ::= { fcFxLoginEntry 8 }

  fcFxPortClass3SeqDelivAgreed OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A flag indicating whether the FxPort has agreed to support
          Class 3 sequential delivery from the Fabric Login. This is
          only meaningful if Class 3 service has been agreed."
  ::= { fcFxLoginEntry 9 }

  fcFxPortNxPortName OBJECT-TYPE
      SYNTAX      FcNameId
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The port name of the attached NxPort."
  ::= { fcFxLoginEntry 10 }

  fcFxPortConnectedNxPort OBJECT-TYPE
      SYNTAX      FcAddressId
```

```
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The address identifier of the destination NxPort with which
          this FxPort is currently engaged in a either a Class 1 or
          loop connection. If this FxPort is not engaged in a
          connection, then the value of this object is '000000'H."
  ::= { fcFxLoginEntry 11 }

  fcFxPortBbCreditModel OBJECT-TYPE
      SYNTAX      FcBbCreditModel
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "This object identifies the BB_Credit model used by the
          FxPort."
  ::= { fcFxLoginEntry 12 }


  -- the Error group
  -- This group consists of tables that contain information about
  -- the various types of errors detected.  The management station
  -- may use the information in this group to determine the
  -- quality of the link between the FxPort and its attached NxPort.

  -- the FxPort Error table
  -- This table contains, one entry for each FxPort in the Fabric
  -- Element, counters recording numbers of errors detected
  -- since the management agent re-initialized.
  -- The first 6 columnar objects after the port index corresponds
  -- to the counters in the Link Error Status Block.

  fcFxPortErrorTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortErrorEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort, counters
          that record the numbers of errors detected."
  ::= { fcFeError 1 }

  fcFxPortErrorEntry OBJECT-TYPE
      SYNTAX      FcFxPortErrorEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing error counters of a FxPort."
      AUGMENTS { fcFxPortEntry }
```

```
  ::= { fcFxPortErrorTable 1 }


  FcFxPortErrorEntry ::=
      SEQUENCE {
          fcFxPortLinkFailures
              Counter32,
          fcFxPortSyncLosses
              Counter32,
          fcFxPortSigLosses
              Counter32,
          fcFxPortPrimSeqProtoErrors
              Counter32,
          fcFxPortInvalidTxWords
              Counter32,
          fcFxPortInvalidCrcs
              Counter32,
          fcFxPortDelimiterErrors
              Counter32,
          fcFxPortAddressIdErrors
              Counter32,
          fcFxPortLinkResetIns
              Counter32,
          fcFxPortLinkResetOuts
              Counter32,
          fcFxPortOlsIns
              Counter32,
          fcFxPortOlsOuts
              Counter32
      }

  fcFxPortLinkFailures OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of link failures detected by this FxPort."
  ::= { fcFxPortErrorEntry 1 }

  fcFxPortSyncLosses OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of loss of synchronization detected by the
          FxPort."
  ::= { fcFxPortErrorEntry 2 }
```

```
  fcFxPortSigLosses OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of loss of signal detected by the FxPort."
  ::= { fcFxPortErrorEntry 3 }

  fcFxPortPrimSeqProtoErrors OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of primitive sequence protocol errors detected
          by the FxPort."
  ::= { fcFxPortErrorEntry 4 }

  fcFxPortInvalidTxWords OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of invalid transmission word detected by the
          FxPort."
  ::= { fcFxPortErrorEntry 5 }

  fcFxPortInvalidCrcs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of invalid CRC detected by this FxPort."
  ::= { fcFxPortErrorEntry 6 }

  fcFxPortDelimiterErrors OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Delimiter Errors detected by this FxPort."
  ::= { fcFxPortErrorEntry 7 }

  fcFxPortAddressIdErrors OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of address identifier errors detected by this
```

```
          FxPort."
    ::= { fcFxPortErrorEntry 8 }

    fcFxPortLinkResetIns OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "The number of Link Reset Protocol received by this FxPort
            from the attached NxPort."
    ::= { fcFxPortErrorEntry 9 }

    fcFxPortLinkResetOuts OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "The number of Link Reset Protocol issued by this FxPort to
            the attached NxPort."
    ::= { fcFxPortErrorEntry 10 }

    fcFxPortOlsIns OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "The number of Offline Sequence received by this FxPort."
    ::= { fcFxPortErrorEntry 11 }

    fcFxPortOlsOuts OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "The number of Offline Sequence issued by this FxPort."
    ::= { fcFxPortErrorEntry 12 }



    -- Accounting Groups:
    -- (1) Class 1 Accounting Group,
    -- (2) Class 2 Accounting Group, and
    -- (3) Class 3 Accounting Group.
    -- Each group consists of a table that contains accounting
    -- information for the FxPorts in the Fabric Element.

    -- the Class 1 Accounting table
    -- This table contains, one entry for each FxPort in the Fabric
```

```
  -- Element, Counter32s for certain types of events occurred in the
  -- the FxPorts since the the management agent has re-initialized.

  fcFxPortC1AccountingTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortC1AccountingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort in the
          Fabric Element, Class 1 accounting information recorded
          since the management agent has re-initialized."
  ::= { fcFeAccounting 1 }

  fcFxPortC1AccountingEntry OBJECT-TYPE
      SYNTAX      FcFxPortC1AccountingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing Class 1 accounting information for each
          FxPort."
      AUGMENTS { fcFxPortEntry }
  ::= { fcFxPortC1AccountingTable 1 }


  FcFxPortC1AccountingEntry ::=
      SEQUENCE {
          fcFxPortC1InFrames
              Counter32,
          fcFxPortC1OutFrames
              Counter32,
          fcFxPortC1InOctets
              Counter32,
          fcFxPortC1OutOctets
              Counter32,
          fcFxPortC1Discards
              Counter32,
          fcFxPortC1FbsyFrames
              Counter32,
          fcFxPortC1FrjtFrames
              Counter32,
          fcFxPortC1InConnections
              Counter32,
          fcFxPortC1OutConnections
              Counter32,
          fcFxPortC1ConnTime
              MilliSeconds
      }
```

```
  fcFxPortC1InFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 frames (other than Class 1 connect-
          request) received by this FxPort from its attached NxPort."
  ::= { fcFxPortC1AccountingEntry 1 }

  fcFxPortC1OutFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 frames (other than Class 1 connect-
          request) delivered through this FxPort to its attached
          NxPort."
  ::= { fcFxPortC1AccountingEntry 2 }

  fcFxPortC1InOctets OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 frame octets, including the frame
          delimiters,  received by this FxPort from its attached
          NxPort."
  ::= { fcFxPortC1AccountingEntry 3 }

  fcFxPortC1OutOctets OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 frame octets, including the frame
          delimiters, delivered through this FxPort its attached
          NxPort."
  ::= { fcFxPortC1AccountingEntry 4 }

  fcFxPortC1Discards OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 frames discarded by this FxPort."
  ::= { fcFxPortC1AccountingEntry 5 }

  fcFxPortC1FbsyFrames OBJECT-TYPE
```

```
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of F_BSY frames generated by this FxPort against
          Class 1 connect-request."
  ::= { fcFxPortC1AccountingEntry 6 }

  fcFxPortC1FrjtFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of F_RJT frames generated by this FxPort against
          Class 1 connect-request."
  ::= { fcFxPortC1AccountingEntry 7 }

  fcFxPortC1InConnections OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 connections successfully established
          in which the attached NxPort is the source of the connect-
          request."
  ::= { fcFxPortC1AccountingEntry 8 }

  fcFxPortC1OutConnections OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 1 connections successfully established
          in which the attached NxPort is the destination of the
          connect-request."
  ::= { fcFxPortC1AccountingEntry 9 }

  fcFxPortC1ConnTime OBJECT-TYPE
      SYNTAX      MilliSeconds
      UNITS       "milliseconds"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The cumulative time that this FxPort has been engaged in
          Class 1 connection.  The amount of time is counted from
          after a connect-request has been accepted until the
          connection is disengaged, either by an EOFdt or Link
          Reset."
```

```
  ::= { fcFxPortC1AccountingEntry 10 }


  -- the Class 2 Accounting table
  -- This table contains, one entry for each FxPort in the Fabric
  -- Element, Counter32s for certain types of events occurred in the
  -- the FxPorts since the the management agent has re-initialized.


  fcFxPortC2AccountingTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortC2AccountingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort in the
          Fabric Element, Class 2 accounting information recorded
          since the management agent has re-initialized."
  ::= { fcFeAccounting 2 }

  fcFxPortC2AccountingEntry OBJECT-TYPE
      SYNTAX      FcFxPortC2AccountingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing Class 2 accounting information for each
          FxPort."
      AUGMENTS { fcFxPortEntry }
  ::= { fcFxPortC2AccountingTable 1 }

  FcFxPortC2AccountingEntry ::=
      SEQUENCE {
          fcFxPortC2InFrames
              Counter32,
          fcFxPortC2OutFrames
                 Counter32,
          fcFxPortC2InOctets
                 Counter32,
          fcFxPortC2OutOctets
                 Counter32,
          fcFxPortC2Discards
                 Counter32,
          fcFxPortC2FbsyFrames
                 Counter32,
          fcFxPortC2FrjtFrames
                 Counter32
      }

  fcFxPortC2InFrames OBJECT-TYPE
```

```
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 2 frames received by this FxPort from
          its attached NxPort."
  ::= { fcFxPortC2AccountingEntry 1 }

  fcFxPortC2OutFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 2 frames delivered through this FxPort
          to its attached NxPort."
  ::= { fcFxPortC2AccountingEntry 2 }

  fcFxPortC2InOctets OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 2 frame octets, including the frame
          delimiters, received by this FxPort from its attached
          NxPort."
  ::= { fcFxPortC2AccountingEntry 3 }

  fcFxPortC2OutOctets OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 2 frame octets, including the frame
          delimiters, delivered through this FxPort to its attached
          NxPort."
  ::= { fcFxPortC2AccountingEntry 4 }

  fcFxPortC2Discards OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 2 frames discarded by this FxPort."
  ::= { fcFxPortC2AccountingEntry 5 }

  fcFxPortC2FbsyFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
```

```
      STATUS      current
      DESCRIPTION
         "The number of F_BSY frames generated by this FxPort against
          Class 2 frames."
  ::= { fcFxPortC2AccountingEntry 6 }

  fcFxPortC2FrjtFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of F_RJT frames generated by this FxPort against
          Class 2 frames."
  ::= { fcFxPortC2AccountingEntry 7 }

  -- the Class 3 Accounting Group
  -- This table contains, one entry for each FxPort in the Fabric
  -- Element, Counter32s for certain types of events occurred in the
  -- the FxPorts since the management agent has re-initialized.

  fcFxPortC3AccountingTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortC3AccountingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort in the
          Fabric Element, Class 3 accounting information recorded
          since the management agent has re-initialized."
  ::= { fcFeAccounting 3 }

  fcFxPortC3AccountingEntry OBJECT-TYPE
      SYNTAX      FcFxPortC3AccountingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing Class 3 accounting information for each
          FxPort."
      AUGMENTS { fcFxPortEntry }
  ::= { fcFxPortC3AccountingTable 1 }


  FcFxPortC3AccountingEntry ::=
      SEQUENCE {
          fcFxPortC3InFrames
              Counter32,
          fcFxPortC3OutFrames
              Counter32,
          fcFxPortC3InOctets
```

```
            Counter32,
        fcFxPortC3OutOctets
            Counter32,
        fcFxPortC3Discards
            Counter32
    }

  fcFxPortC3InFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 3 frames received by this FxPort from
          its attached NxPort."
  ::= { fcFxPortC3AccountingEntry 1 }

  fcFxPortC3OutFrames OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 3 frames delivered through this FxPort
          to its attached NxPort."
  ::= { fcFxPortC3AccountingEntry 2 }

  fcFxPortC3InOctets OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 3 frame octets, including the frame
          delimiters, received by this FxPort from its attached
          NxPort."
  ::= { fcFxPortC3AccountingEntry 3 }

  fcFxPortC3OutOctets OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The number of Class 3 frame octets, including the frame
          delimiters, delivered through this FxPort to its attached
          NxPort."
  ::= { fcFxPortC3AccountingEntry 4 }

  fcFxPortC3Discards OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
```

```
      STATUS      current
      DESCRIPTION
         "The number of Class 3 frames discarded by this FxPort."
  ::= { fcFxPortC3AccountingEntry 5 }


  -- The Capability Group - consists of a table describing
  -- information about what each FxPort is inherently capable
  -- of operating or supporting.
  -- A capability may be used, as expressed in its respective
  -- object value in the Configuration group.

  fcFxPortCapTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF FcFxPortCapEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A table that contains, one entry for each FxPort, the
          capabilities of the port within the Fabric Element."
  ::= { fcFeCapabilities 1 }

  fcFxPortCapEntry OBJECT-TYPE
      SYNTAX      FcFxPortCapEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "An entry containing the Cap of a FxPort."
      AUGMENTS { fcFxPortEntry }
  ::= { fcFxPortCapTable 1 }


  FcFxPortCapEntry ::=
      SEQUENCE {
          fcFxPortCapFcphVersionHigh
              FcphVersion,
          fcFxPortCapFcphVersionLow
              FcphVersion,
          fcFxPortCapBbCreditMax
              FcBbCredit,
          fcFxPortCapBbCreditMin
              FcBbCredit,
          fcFxPortCapRxDataFieldSizeMax
              FcRxDataFieldSize,
          fcFxPortCapRxDataFieldSizeMin
              FcRxDataFieldSize,
          fcFxPortCapCos
              FcCosCap,
          fcFxPortCapIntermix
```

```
            TruthValue,
        fcFxPortCapStackedConnMode
            FcStackedConnMode,
        fcFxPortCapClass2SeqDeliv
            TruthValue,
        fcFxPortCapClass3SeqDeliv
            TruthValue,
        fcFxPortCapHoldTimeMax
            MicroSeconds,
        fcFxPortCapHoldTimeMin
            MicroSeconds
    }

  fcFxPortCapFcphVersionHigh OBJECT-TYPE
      SYNTAX      FcphVersion
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The highest or most recent version of FC-PH that the FxPort
          is capable of supporting."
  ::= { fcFxPortCapEntry 1 }

  fcFxPortCapFcphVersionLow OBJECT-TYPE
      SYNTAX      FcphVersion
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The lowest or earliest version of FC-PH that the FxPort is
          capable of supporting."
  ::= { fcFxPortCapEntry 2 }

  fcFxPortCapBbCreditMax OBJECT-TYPE
      SYNTAX      FcBbCredit
      UNITS       "buffers"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The maximum number of receive buffers available for holding
          Class 1 connect-request, Class 2 or Class 3 frames from the
          attached NxPort."
  ::= { fcFxPortCapEntry 3 }

  fcFxPortCapBbCreditMin OBJECT-TYPE
      SYNTAX      FcBbCredit
      UNITS       "buffers"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
```

```
          "The minimum number of receive buffers available for holding
           Class 1 connect-request, Class 2 or Class 3 frames from the
           attached NxPort."
    ::= { fcFxPortCapEntry 4 }

    fcFxPortCapRxDataFieldSizeMax OBJECT-TYPE
        SYNTAX      FcRxDataFieldSize
        UNITS       "bytes"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "The maximum size in bytes of the Data Field in a frame that
            the FxPort is capable of receiving from its attached
            NxPort."
    ::= { fcFxPortCapEntry 5 }

    fcFxPortCapRxDataFieldSizeMin OBJECT-TYPE
        SYNTAX      FcRxDataFieldSize
        UNITS       "bytes"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "The minimum size in bytes of the Data Field in a frame that
            the FxPort is capable of receiving from its attached
            NxPort."
    ::= { fcFxPortCapEntry 6 }

    fcFxPortCapCos OBJECT-TYPE
        SYNTAX      FcCosCap
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "A value indicating the set of Classes of Service that the
            FxPort is capable of supporting."
    ::= { fcFxPortCapEntry 7 }

    fcFxPortCapIntermix OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "A flag indicating whether or not the FxPort is capable of
            supporting the intermixing of Class 2 and Class 3 frames
            during a Class 1 connection. This flag is only valid if the
            port is capable of supporting Class 1 service."
    ::= { fcFxPortCapEntry 8 }

    fcFxPortCapStackedConnMode OBJECT-TYPE
```

```
      SYNTAX      FcStackedConnMode
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A value indicating the mode of Stacked Connect request that
          the FxPort is capable of supporting."
  ::= { fcFxPortCapEntry 9 }

  fcFxPortCapClass2SeqDeliv OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A flag indicating whether or not the FxPort is capable of
          supporting Class 2 Sequential Delivery."
  ::= { fcFxPortCapEntry 10 }

  fcFxPortCapClass3SeqDeliv OBJECT-TYPE
      SYNTAX      TruthValue
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "A flag indicating whether or not the FxPort is capable of
          supporting Class 3 Sequential Delivery."
  ::= { fcFxPortCapEntry 11 }

  fcFxPortCapHoldTimeMax OBJECT-TYPE
      SYNTAX      MicroSeconds
      UNITS       "microseconds"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The maximum holding time (in microseconds) that the FxPort
          is capable of supporting."
  ::= { fcFxPortCapEntry 12 }

  fcFxPortCapHoldTimeMin OBJECT-TYPE
      SYNTAX      MicroSeconds
      UNITS       "microseconds"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The minimum holding time (in microseconds) that the FxPort
          is capable of supporting."
  ::= { fcFxPortCapEntry 13 }

  -- conformance information
```

```
  fcFeMIBConformance OBJECT IDENTIFIER  ::= { fcFeMIB 2 }
  fcFeMIBCompliances  OBJECT IDENTIFIER ::= { fcFeMIBConformance 1 }
  fcFeMIBGroups       OBJECT IDENTIFIER ::= { fcFeMIBConformance 2 }

  -- compliance statements
  fcFeMIBMinimumCompliance   MODULE-COMPLIANCE
      STATUS   current
      DESCRIPTION
         "The minimum compliance statement for SNMP entities
          which implement the FIBRE-CHANNEL-FE-MIB."
      MODULE  -- this module
      MANDATORY-GROUPS { fcFeConfigGroup, fcFeStatusGroup,
                         fcFeErrorGroup }

      OBJECT        fcFeFabricName
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFeElementName
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFeModuleName
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortAdminMode
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortPhysAdminStatus
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortPhysRttov
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortBbCreditModel
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."
```

```
   ::= { fcFeMIBCompliances 1 }

  fcFeMIBFullCompliance   MODULE-COMPLIANCE
      STATUS   current
      DESCRIPTION
         "The full compliance statement for SNMP entities
          which implement the FIBRE-CHANNEL-FE-MIB."
      MODULE  -- this module
      MANDATORY-GROUPS { fcFeConfigGroup, fcFeStatusGroup,
                         fcFeErrorGroup,  fcFeCapabilitiesGroup }

      GROUP fcFeClass1AccountingGroup
      DESCRIPTION
         "This group is mandatory for all fibre channel fabric
          elements which support class 1 frames."

      GROUP fcFeClass2AccountingGroup
      DESCRIPTION
         "This group is mandatory for all fibre channel fabric
          elements which support class 2 frames."

      GROUP fcFeClass3AccountingGroup
      DESCRIPTION
         "This group is mandatory for all fibre channel fabric
          elements which support class 3 frames."

      OBJECT        fcFeFabricName
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFeElementName
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFeModuleName
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortAdminMode
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortPhysAdminStatus
      MIN-ACCESS    read-only
```

```
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortPhysRttov
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

      OBJECT        fcFxPortBbCreditModel
      MIN-ACCESS    read-only
      DESCRIPTION
         "Write access is not required."

   ::= { fcFeMIBCompliances 2 }

   -- units of conformance
   fcFeConfigGroup  OBJECT-GROUP
      OBJECTS { fcFeFabricName, fcFeElementName, fcFeModuleCapacity,
                fcFeModuleDescr, fcFeModuleObjectID,
                fcFeModuleOperStatus, fcFeModuleLastChange,
                fcFeModuleFxPortCapacity, fcFeModuleName,
                fcFxPortName, fcFxPortFcphVersionHigh,
                fcFxPortFcphVersionLow, fcFxPortBbCredit,
                fcFxPortRxBufSize, fcFxPortRatov, fcFxPortEdtov,
                fcFxPortCosSupported, fcFxPortIntermixSupported,
                fcFxPortStackedConnMode, fcFxPortClass2SeqDeliv,
                fcFxPortClass3SeqDeliv, fcFxPortHoldTime }
      STATUS    current
      DESCRIPTION
         "A collection of objects providing the configuration and service
          parameters of the Fabric Element, the modules, and FxPorts."
   ::= { fcFeMIBGroups 1 }

  fcFeStatusGroup  OBJECT-GROUP
     OBJECTS { fcFxPortID, fcFxPortBbCreditAvailable,
               fcFxPortOperMode, fcFxPortAdminMode,
               fcFxPortPhysAdminStatus, fcFxPortPhysOperStatus,
               fcFxPortPhysLastChange, fcFxPortPhysRttov,
               fcFxPortFcphVersionAgreed, fcFxPortNxPortBbCredit,
               fcFxPortNxPortRxDataFieldSize, fcFxPortCosSuppAgreed,
               fcFxPortIntermixSuppAgreed,
               fcFxPortStackedConnModeAgreed,
               fcFxPortClass2SeqDelivAgreed,
               fcFxPortClass3SeqDelivAgreed,
               fcFxPortNxPortName, fcFxPortConnectedNxPort,
               fcFxPortBbCreditModel }
     STATUS    current
     DESCRIPTION
```

```
        "A collection of objects providing the operational status and
         established service parameters for the Fabric Element and the
         attached NxPorts."
   ::= { fcFeMIBGroups 2 }

   fcFeErrorGroup  OBJECT-GROUP
      OBJECTS { fcFxPortLinkFailures, fcFxPortSyncLosses,
                fcFxPortSigLosses, fcFxPortPrimSeqProtoErrors,
                fcFxPortInvalidTxWords, fcFxPortInvalidCrcs,
                fcFxPortDelimiterErrors, fcFxPortAddressIdErrors,
                fcFxPortLinkResetIns, fcFxPortLinkResetOuts,
                fcFxPortOlsIns, fcFxPortOlsOuts }
      STATUS    current
      DESCRIPTION
         "A collection of objects providing various error
          statistics detected by the FxPorts."
   ::= { fcFeMIBGroups 3 }

   fcFeClass1AccountingGroup  OBJECT-GROUP
      OBJECTS { fcFxPortC1InFrames, fcFxPortC1OutFrames,
                fcFxPortC1InOctets, fcFxPortC1OutOctets,
                fcFxPortC1Discards, fcFxPortC1FbsyFrames,
                fcFxPortC1FrjtFrames, fcFxPortC1InConnections,
                fcFxPortC1OutConnections, fcFxPortC1ConnTime
      }
      STATUS    current
      DESCRIPTION
         "A collection of objects providing various class 1
  performance statistics detected by the FxPorts."
   ::= { fcFeMIBGroups 4 }

   fcFeClass2AccountingGroup  OBJECT-GROUP
      OBJECTS { fcFxPortC2InFrames, fcFxPortC2OutFrames,
                fcFxPortC2InOctets, fcFxPortC2OutOctets,
                fcFxPortC2Discards, fcFxPortC2FbsyFrames,
                fcFxPortC2FrjtFrames
      }
      STATUS    current
      DESCRIPTION
         "A collection of objects providing various class 2
  performance statistics detected by the FxPorts."
   ::= { fcFeMIBGroups 5 }

   fcFeClass3AccountingGroup  OBJECT-GROUP
      OBJECTS { fcFxPortC3InFrames, fcFxPortC3OutFrames,
                fcFxPortC3InOctets, fcFxPortC3OutOctets,
                fcFxPortC3Discards
      }
```

```
      STATUS    current
      DESCRIPTION
         "A collection of objects providing various class 3
          performance statistics detected by the FxPorts."
   ::= { fcFeMIBGroups 6 }

  fcFeCapabilitiesGroup  OBJECT-GROUP
     OBJECTS { fcFxPortCapFcphVersionHigh, fcFxPortCapFcphVersionLow,
               fcFxPortCapBbCreditMax, fcFxPortCapBbCreditMin,
               fcFxPortCapRxDataFieldSizeMax,
               fcFxPortCapRxDataFieldSizeMin,
               fcFxPortCapCos, fcFxPortCapIntermix,
               fcFxPortCapStackedConnMode, fcFxPortCapClass2SeqDeliv,
               fcFxPortCapClass3SeqDeliv, fcFxPortCapHoldTimeMax,
               fcFxPortCapHoldTimeMin
     }
     STATUS    current
     DESCRIPTION
        "A collection of objects providing the inherent
         capability of each FxPort within the Fabric Element."
   ::= { fcFeMIBGroups 7 }


  END
  -- End of Object Definitions
```

4. Security Considerations

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [12] and the View-based Access Control Model RFC 2575 [15] is recommended.

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

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8. Editor's Address

Kha Sin Teow
Brocade Communications Systems, Inc.
1901 Guadalupe Parkway,
San Jose, CA 95131
U.S.A.

Phone: +1 408-487-8180
Email: khasin@Brocade.COM

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