

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

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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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 `fcFeModuleFxpPortCapacity` indicates the maximum number of ports that a given module may contain. The value of `fcFeModuleFxpPortCapacity` 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..`fcFeModuleFxpPortCapacity`). 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.



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,
    fcFeModuleFxpPortCapacity
        FcFeFxpPortCapacity,
    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 }

fcFeModuleFxpPortCapacity OBJECT-TYPE
    SYNTAX      FcFeFxpPortCapacity

```

```

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
fcFxpPortFcphVersionHigh
    FcphVersion,
fcFxpPortFcphVersionLow
    FcphVersion,
fcFxpPortBbCredit
    FcBbCredit,
fcFxpPortRxBufSize
    FcRxDataFieldSize,
fcFxpPortRatov
    MilliSeconds,
fcFxpPortEdtov
    MilliSeconds,
-- FxPort class service parameters
fcFxpPortCosSupported
    FcCosCap,
fcFxpPortIntermixSupported
    TruthValue,
fcFxpPortStackedConnMode
    FcStackedConnMode,
fcFxpPortClass2SeqDeliv
    TruthValue,
fcFxpPortClass3SeqDeliv
    TruthValue,
-- other configuration parameters
fcFxpPortHoldTime
    MicroSeconds
}

```

fcFxpPortIndex OBJECT-TYPE

```

SYNTAX      FcFeFxpPortIndex
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."

```
 ::= { fcFxpPortEntry 1 }
```

fcFxpPortName 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."

```
 ::= { fcFxpPortEntry 2 }
```

```
-- FxPort common service parameters

fcFxpPortFcphVersionHigh 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."
 ::= { fcFxpPortEntry 3 }

fcFxpPortFcphVersionLow 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."
 ::= { fcFxpPortEntry 4 }

fcFxpPortBbCredit 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."
 ::= { fcFxpPortEntry 5 }

fcFxpPortRxBufSize 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."
 ::= { fcFxpPortEntry 6 }

fcFxpPortRatov 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."

```
::= { fcFxpPortEntry 11 }

fcFxpPortClass2SeqDeliv 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 FxpPort."
 ::= { fcFxpPortEntry 12 }

fcFxpPortClass3SeqDeliv 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 FxpPort."
 ::= { fcFxpPortEntry 13 }

-- other FxpPort parameters

fcFxpPortHoldTime OBJECT-TYPE
    SYNTAX      MicroSeconds
    UNITS       "microseconds"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The maximum time (in microseconds) that the FxpPort shall
        hold a frame before discarding the frame if it is unable to
        deliver the frame. The value 0 means that the FxpPort does
        not support this parameter."
 ::= { fcFxpPortEntry 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 FxpPort Status table
-- This table contains, one entry for each FxpPort,
-- the operational status and parameters of the FxpPorts.

fcFxpPortStatusTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcFxpPortStatusEntry
```

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 }

fcFxFPortStatusEntry OBJECT-TYPE

SYNTAX FcFxFPortStatusEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"An entry containing operational status and parameters of a FxPort."

AUGMENTS { fcFxFPortEntry }

::= { fcFxFPortStatusTable 1 }

FcFxFPortStatusEntry ::=

SEQUENCE {  
     fcFxFPortID  
         FcAddressId,  
     fcFxFPortBbCreditAvailable  
         Gauge32,  
     fcFxFPortOperMode  
         INTEGER,  
     fcFxFPortAdminMode  
         INTEGER  
 }

fcFxFPortID 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."

::= { fcFxFPortStatusEntry 1 }

fcFxFPortBbCreditAvailable 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
fcFxFPortBbCredit."
 ::= { fcFxFPortStatusEntry 2 }

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

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

fcFxFPortPhysTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF FcFxFPortPhysEntry
    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 }

fcFxFPortPhysEntry OBJECT-TYPE
    SYNTAX          FcFxFPortPhysEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry containing physical level status and parameters of
        a FxPort."
    AUGMENTS { fcFxFPortEntry }
 ::= { fcFxFPortPhysTable 1 }

FcFxFPortPhysEntry ::=

```

```

SEQUENCE {
    fcFxpPortPhysAdminStatus
        INTEGER,
    fcFxpPortPhysOperStatus
        INTEGER,
    fcFxpPortPhysLastChange
        TimeStamp,
    fcFxpPortPhysRttov
        MilliSeconds
}

```

fcFxpPortPhysAdminStatus 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 fcFxpPortPhysAdminStatus in the offline(2) state. As the result of either explicit management action or per configuration information accessible by the Fabric Element, fcFxpPortPhysAdminStatus is then changed to either the online(1) or testing(3) states, or remains in the offline state."

```
 ::= { fcFxpPortPhysEntry 1 }
```

fcFxpPortPhysOperStatus 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 fcFxpPortPhysAdminStatus is offline(2) then fcFxpPortPhysOperStatus should be offline(2). If fcFxpPortPhysAdminStatus is changed to online(1) then fcFxpPortPhysOperStatus 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 }
```

```

fcFxFxLoginEntry OBJECT-TYPE
    SYNTAX      FcFxFxLoginEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry containing service parameters established from a
        successful Fabric Login."
    INDEX { fcFeModuleIndex, fcFxFxPortIndex, fcFxFxPortNxLoginIndex }
    ::= { fcFxFxLoginTable 1 }

```

```

FcFxFxLoginEntry ::=
    SEQUENCE {
        fcFxFxPortNxLoginIndex
            FcFeNxPortIndex,
        fcFxFxPortFcphVersionAgreed
            FcphVersion,
        fcFxFxPortNxPortBbCredit
            FcBbCredit,
        fcFxFxPortNxPortRxDataFieldSize
            FcRxDataFieldSize,
        fcFxFxPortCosSuppAgreed
            FcCosCap,
        fcFxFxPortIntermixSuppAgreed
            TruthValue,
        fcFxFxPortStackedConnModeAgreed
            FcStackedConnMode,
        fcFxFxPortClass2SeqDelivAgreed
            TruthValue,
        fcFxFxPortClass3SeqDelivAgreed
            TruthValue,
        --
        fcFxFxPortNxPortName
            FcNameId,
        fcFxFxPortConnectedNxPort
            FcAddressId,
        fcFxFxPortBbCreditModel
            FcBbCreditModel
    }

```

```

fcFxFxPortNxLoginIndex 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."
    ::= { fcFxFxLoginEntry 1 }

```

```

fcFxpPortFcphVersionAgreed 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"
 ::= { fcFxpLoginEntry 2 }

fcFxpPortNxPortBbCredit 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 fcFxpPortBbCreditModel."
 ::= { fcFxpLoginEntry 3 }

fcFxpPortNxPortRxDataFieldSize 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."
 ::= { fcFxpLoginEntry 4 }

fcFxpPortCosSuppAgreed 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."
 ::= { fcFxpLoginEntry 5 }

fcFxpPortIntermixSuppAgreed 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."

::= { fcFxFxLoginEntry 6 }

## fcFxFxPortStackedConnModeAgreed 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."

::= { fcFxFxLoginEntry 7 }

## fcFxFxPortClass2SeqDelivAgreed 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."

::= { fcFxFxLoginEntry 8 }

## fcFxFxPortClass3SeqDelivAgreed 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."

::= { fcFxFxLoginEntry 9 }

## fcFxFxPortNxPortName OBJECT-TYPE

SYNTAX FcNameId

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The port name of the attached NxPort."

::= { fcFxFxLoginEntry 10 }

## fcFxFxPortConnectedNxPort 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."
 ::= { fcFxFxLoginEntry 11 }

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

fcFxFxPortErrorTable OBJECT-TYPE
    SYNTAX SEQUENCE OF FcFxFxPortErrorEntry
    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 }

fcFxFxPortErrorEntry OBJECT-TYPE
    SYNTAX FcFxFxPortErrorEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry containing error counters of a FxPort."
    AUGMENTS { fcFxFxPortEntry }

```

```
::= { fcFxpPortErrorTable 1 }
```

```
FcFxpPortErrorEntry ::=
  SEQUENCE {
    fcFxpPortLinkFailures
      Counter32,
    fcFxpPortSyncLosses
      Counter32,
    fcFxpPortSigLosses
      Counter32,
    fcFxpPortPrimSeqProtoErrors
      Counter32,
    fcFxpPortInvalidTxWords
      Counter32,
    fcFxpPortInvalidCrcs
      Counter32,
    fcFxpPortDelimiterErrors
      Counter32,
    fcFxpPortAddressIdErrors
      Counter32,
    fcFxpPortLinkResetIns
      Counter32,
    fcFxpPortLinkResetOuts
      Counter32,
    fcFxpPortOlsIns
      Counter32,
    fcFxpPortOlsOuts
      Counter32
  }
```

```
fcFxpPortLinkFailures OBJECT-TYPE
```

```
  SYNTAX      Counter32
```

```
  MAX-ACCESS  read-only
```

```
  STATUS      current
```

```
  DESCRIPTION
```

```
    "The number of link failures detected by this FxPort."
```

```
::= { fcFxpPortErrorEntry 1 }
```

```
fcFxpPortSyncLosses OBJECT-TYPE
```

```
  SYNTAX      Counter32
```

```
  MAX-ACCESS  read-only
```

```
  STATUS      current
```

```
  DESCRIPTION
```

```
    "The number of loss of synchronization detected by the
     FxPort."
```

```
::= { fcFxpPortErrorEntry 2 }
```

```

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

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

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

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

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

fcFxpPortAddressIdErrors 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.

fcFxpPortC1AccountingTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcFxpPortC1AccountingEntry

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 }

fcFxpPortC1AccountingEntry OBJECT-TYPE

SYNTAX FcFxpPortC1AccountingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing Class 1 accounting information for each  
 FxPort."

AUGMENTS { fcFxpPortEntry }

::= { fcFxpPortC1AccountingTable 1 }

FcFxpPortC1AccountingEntry ::=

SEQUENCE {

fcFxpPortC1InFrames

Counter32,

fcFxpPortC1OutFrames

Counter32,

fcFxpPortC1InOctets

Counter32,

fcFxpPortC1OutOctets

Counter32,

fcFxpPortC1Discards

Counter32,

fcFxpPortC1FbsyFrames

Counter32,

fcFxpPortC1FrjtFrames

Counter32,

fcFxpPortC1InConnections

Counter32,

fcFxpPortC1OutConnections

Counter32,

fcFxpPortC1ConnTime

MilliSeconds

}

```
fcFxpPortC1InFrames 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 FxpPort from its attached NxPort."
 ::= { fcFxpPortC1AccountingEntry 1 }

fcFxpPortC1OutFrames 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 FxpPort to its attached
         NxPort."
 ::= { fcFxpPortC1AccountingEntry 2 }

fcFxpPortC1InOctets 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 FxpPort from its attached
         NxPort."
 ::= { fcFxpPortC1AccountingEntry 3 }

fcFxpPortC1OutOctets 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 FxpPort its attached
         NxPort."
 ::= { fcFxpPortC1AccountingEntry 4 }

fcFxpPortC1Discards OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of Class 1 frames discarded by this FxpPort."
 ::= { fcFxpPortC1AccountingEntry 5 }

fcFxpPortC1FbsyFrames 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."
 ::= { fcFxPortClAccountingEntry 6 }

fcFxPortClFrjtFrames 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."
 ::= { fcFxPortClAccountingEntry 7 }

fcFxPortClInConnections 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."
 ::= { fcFxPortClAccountingEntry 8 }

fcFxPortClOutConnections 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."
 ::= { fcFxPortClAccountingEntry 9 }

fcFxPortClConnTime 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."

```

```
::= { fcFxpPortC1AccountingEntry 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.
```

```
fcFxpPortC2AccountingTable OBJECT-TYPE
```

```
SYNTAX SEQUENCE OF FcFxpPortC2AccountingEntry
```

```
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 }
```

```
fcFxpPortC2AccountingEntry OBJECT-TYPE
```

```
SYNTAX FcFxpPortC2AccountingEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

```
"An entry containing Class 2 accounting information for each
FxPort."
```

```
AUGMENTS { fcFxpPortEntry }
```

```
::= { fcFxpPortC2AccountingTable 1 }
```

```
FcFxpPortC2AccountingEntry ::=
```

```
SEQUENCE {
```

```
fcFxpPortC2InFrames
```

```
Counter32,
```

```
fcFxpPortC2OutFrames
```

```
Counter32,
```

```
fcFxpPortC2InOctets
```

```
Counter32,
```

```
fcFxpPortC2OutOctets
```

```
Counter32,
```

```
fcFxpPortC2Discards
```

```
Counter32,
```

```
fcFxpPortC2FbsyFrames
```

```
Counter32,
```

```
fcFxpPortC2FrjtFrames
```

```
Counter32
```

```
}
```

```
fcFxpPortC2InFrames 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."
 ::= { fcFxpPortC2AccountingEntry 6 }

fcFxpPortC2FrjtFrames 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."
 ::= { fcFxpPortC2AccountingEntry 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.

fcFxpPortC3AccountingTable OBJECT-TYPE
SYNTAX      SEQUENCE OF FcFxpPortC3AccountingEntry
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 }

fcFxpPortC3AccountingEntry OBJECT-TYPE
SYNTAX      FcFxpPortC3AccountingEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry containing Class 3 accounting information for each
    FxPort."
AUGMENTS { fcFxpPortEntry }
 ::= { fcFxpPortC3AccountingTable 1 }

FcFxpPortC3AccountingEntry ::=
SEQUENCE {
    fcFxpPortC3InFrames
        Counter32,
    fcFxpPortC3OutFrames
        Counter32,
    fcFxpPortC3InOctets

```

```

        Counter32,
        fcFxpPortC3OutOctets
        Counter32,
        fcFxpPortC3Discards
        Counter32
    }

fcFxpPortC3InFrames 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."
    ::= { fcFxpPortC3AccountingEntry 1 }

fcFxpPortC3OutFrames 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."
    ::= { fcFxpPortC3AccountingEntry 2 }

fcFxpPortC3InOctets 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."
    ::= { fcFxpPortC3AccountingEntry 3 }

fcFxpPortC3OutOctets 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."
    ::= { fcFxpPortC3AccountingEntry 4 }

fcFxpPortC3Discards OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only

```

```

STATUS      current
DESCRIPTION
    "The number of Class 3 frames discarded by this FxPort."
 ::= { fcFxpPortC3AccountingEntry 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.

```

```

fcFxpPortCapTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcFxpPortCapEntry
    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 }

```

```

fcFxpPortCapEntry OBJECT-TYPE
    SYNTAX      FcFxpPortCapEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry containing the Cap of a FxPort."
    AUGMENTS { fcFxpPortEntry }
 ::= { fcFxpPortCapTable 1 }

```

```

FcFxpPortCapEntry ::=
    SEQUENCE {
        fcFxpPortCapFcphVersionHigh
            FcphVersion,
        fcFxpPortCapFcphVersionLow
            FcphVersion,
        fcFxpPortCapBbCreditMax
            FcBbCredit,
        fcFxpPortCapBbCreditMin
            FcBbCredit,
        fcFxpPortCapRxDataFieldSizeMax
            FcRxDataFieldSize,
        fcFxpPortCapRxDataFieldSizeMin
            FcRxDataFieldSize,
        fcFxpPortCapCos
            FcCosCap,
        fcFxpPortCapIntermix
    }

```

```

        TruthValue,
        fcFxpPortCapStackedConnMode
        FcStackedConnMode,
        fcFxpPortCapClass2SeqDeliv
        TruthValue,
        fcFxpPortCapClass3SeqDeliv
        TruthValue,
        fcFxpPortCapHoldTimeMax
        MicroSeconds,
        fcFxpPortCapHoldTimeMin
        MicroSeconds
    }

```

fcFxpPortCapFcphVersionHigh 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."

::= { fcFxpPortCapEntry 1 }

fcFxpPortCapFcphVersionLow 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."

::= { fcFxpPortCapEntry 2 }

fcFxpPortCapBbCreditMax 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."

::= { fcFxpPortCapEntry 3 }

fcFxpPortCapBbCreditMin 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."

```
 ::= { fcFxpPortCapEntry 4 }
```

fcFxpPortCapRxDataFieldSizeMax 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."

```
 ::= { fcFxpPortCapEntry 5 }
```

fcFxpPortCapRxDataFieldSizeMin 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."

```
 ::= { fcFxpPortCapEntry 6 }
```

fcFxpPortCapCos 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."

```
 ::= { fcFxpPortCapEntry 7 }
```

fcFxpPortCapIntermix 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."

```
 ::= { fcFxpPortCapEntry 8 }
```

fcFxpPortCapStackedConnMode 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."
 ::= { fcFxpPortCapEntry 9 }

fcFxpPortCapClass2SeqDeliv 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."
 ::= { fcFxpPortCapEntry 10 }

fcFxpPortCapClass3SeqDeliv 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."
 ::= { fcFxpPortCapEntry 11 }

fcFxpPortCapHoldTimeMax 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."
 ::= { fcFxpPortCapEntry 12 }

fcFxpPortCapHoldTimeMin 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."
 ::= { fcFxpPortCapEntry 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          fcFxFPortAdminMode
MIN-ACCESS      read-only
DESCRIPTION     "Write access is not required."

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

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

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

    OBJECT          fcFxpPortPhysAdminStatus
    MIN-ACCESS      read-only
```

## DESCRIPTION

"Write access is not required."

OBJECT fcFxpPortPhysRttov

MIN-ACCESS read-only

## DESCRIPTION

"Write access is not required."

OBJECT fcFxpPortBbCreditModel

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,  
fcFeModuleFxpPortCapacity, fcFeModuleName,  
fcFxpPortName, fcFxpPortFcphVersionHigh,  
fcFxpPortFcphVersionLow, fcFxpPortBbCredit,  
fcFxpPortRxBufSize, fcFxpPortRatov, fcFxpPortEdtov,  
fcFxpPortCosSupported, fcFxpPortIntermixSupported,  
fcFxpPortStackedConnMode, fcFxpPortClass2SeqDeliv,  
fcFxpPortClass3SeqDeliv, fcFxpPortHoldTime }

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 { fcFxpPortID, fcFxpPortBbCreditAvailable,  
fcFxpPortOperMode, fcFxpPortAdminMode,  
fcFxpPortPhysAdminStatus, fcFxpPortPhysOperStatus,  
fcFxpPortPhysLastChange, fcFxpPortPhysRttov,  
fcFxpPortFcphVersionAgreed, fcFxpPortNxPortBbCredit,  
fcFxpPortNxPortRxDataFieldSize, fcFxpPortCosSuppAgreed,  
fcFxpPortIntermixSuppAgreed,  
fcFxpPortStackedConnModeAgreed,  
fcFxpPortClass2SeqDelivAgreed,  
fcFxpPortClass3SeqDelivAgreed,  
fcFxpPortNxPortName, fcFxpPortConnectedNxPort,  
fcFxpPortBbCreditModel }

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 { fcFxpPortLinkFailures, fcFxpPortSyncLosses,
          fcFxpPortSigLosses, fcFxpPortPrimSeqProtoErrors,
          fcFxpPortInvalidTxWords, fcFxpPortInvalidCrcs,
          fcFxpPortDelimiterErrors, fcFxpPortAddressIdErrors,
          fcFxpPortLinkResetIns, fcFxpPortLinkResetOuts,
          fcFxpPortOlsIns, fcFxpPortOlsOuts }
```

```
STATUS current
```

```
DESCRIPTION
```

"A collection of objects providing various error statistics detected by the FxPorts."

```
::= { fcFeMIBGroups 3 }
```

```
fcFeClass1AccountingGroup OBJECT-GROUP
```

```
OBJECTS { fcFxpPortC1InFrames, fcFxpPortC1OutFrames,
          fcFxpPortC1InOctets, fcFxpPortC1OutOctets,
          fcFxpPortC1Discards, fcFxpPortC1FbsyFrames,
          fcFxpPortC1FrjtFrames, fcFxpPortC1InConnections,
          fcFxpPortC1OutConnections, fcFxpPortC1ConnTime
        }
```

```
STATUS current
```

```
DESCRIPTION
```

"A collection of objects providing various class 1 performance statistics detected by the FxPorts."

```
::= { fcFeMIBGroups 4 }
```

```
fcFeClass2AccountingGroup OBJECT-GROUP
```

```
OBJECTS { fcFxpPortC2InFrames, fcFxpPortC2OutFrames,
          fcFxpPortC2InOctets, fcFxpPortC2OutOctets,
          fcFxpPortC2Discards, fcFxpPortC2FbsyFrames,
          fcFxpPortC2FrjtFrames
        }
```

```
STATUS current
```

```
DESCRIPTION
```

"A collection of objects providing various class 2 performance statistics detected by the FxPorts."

```
::= { fcFeMIBGroups 5 }
```

```
fcFeClass3AccountingGroup OBJECT-GROUP
```

```
OBJECTS { fcFxpPortC3InFrames, fcFxpPortC3OutFrames,
          fcFxpPortC3InOctets, fcFxpPortC3OutOctets,
          fcFxpPortC3Discards
        }
```

```

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

```

```

fcFeCapabilitiesGroup OBJECT-GROUP
OBJECTS { fcFxpPortCapFcphVersionHigh, fcFxpPortCapFcphVersionLow,
          fcFxpPortCapBbCreditMax, fcFxpPortCapBbCreditMin,
          fcFxpPortCapRxDataFieldSizeMax,
          fcFxpPortCapRxDataFieldSizeMin,
          fcFxpPortCapCos, fcFxpPortCapIntermix,
          fcFxpPortCapStackedConnMode, fcFxpPortCapClass2SeqDeliv,
          fcFxpPortCapClass3SeqDeliv, fcFxpPortCapHoldTimeMax,
          fcFxpPortCapHoldTimeMin
        }
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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