

Network Working Group
Request for Comments: 2837
Category: Standards Track

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May 2000

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.

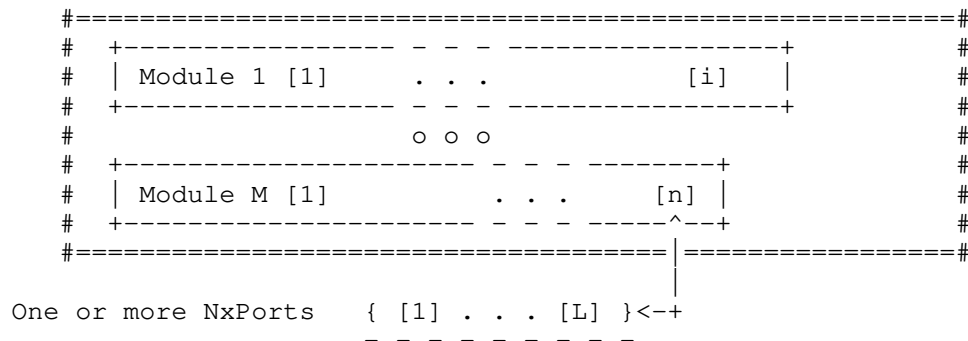
Each module is uniquely identified by a module number in the range of 1 through `fcFeModuleCapacity` inclusive. Modules may come and go without causing a management reset (of `sysUpTime`), and may be sparsely numbered within the Fabric Element. That is, the module numbering is not required to be contiguous. 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.

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
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WG Mailing list:ipfc@standards.gadzoos.com
 To Subscribe: ipfc-request@standards.gadzoos.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
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 }

fcFxpPortStatusEntry OBJECT-TYPE
    SYNTAX      FcFxpPortStatusEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry containing operational status and parameters of a
        FxPort."
    AUGMENTS { fcFxpPortEntry }
::= { fcFxpPortStatusTable 1 }

FcFxpPortStatusEntry ::=
    SEQUENCE {
        fcFxpPortID
            FcAddressId,
        fcFxpPortBbCreditAvailable
            Gauge32,
        fcFxpPortOperMode
            INTEGER,
        fcFxpPortAdminMode
            INTEGER
    }

fcFxpPortID    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."
::= { fcFxpPortStatusEntry 1 }

fcFxpPortBbCreditAvailable 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 fcFxpPortBbCredit."

::= { fcFxpPortStatusEntry 2 }

fcFxpPortOperMode OBJECT-TYPE

SYNTAX INTEGER { unknown(1), fPort(2), flPort(3) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current operational mode of the FxPort."

::= { fcFxpPortStatusEntry 3 }

fcFxpPortAdminMode OBJECT-TYPE

SYNTAX INTEGER { fPort(2), flPort(3) }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The desired operational mode of the FxPort."

::= { fcFxpPortStatusEntry 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.

fcFxpPortPhysTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcFxpPortPhysEntry

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 }

fcFxpPortPhysEntry OBJECT-TYPE

SYNTAX FcFxpPortPhysEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing physical level status and parameters of a FxPort."

AUGMENTS { fcFxpPortEntry }

::= { fcFxpPortPhysTable 1 }

FcFxpPortPhysEntry ::=

```
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 FxpPort 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 FxpPort 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 FxpPort for the support of classes of services and the FxpPort 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."

::= { 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 }

```



```
::= { 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."
::= { 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,
        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."
::= { 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."

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

    OBJECT      fcFxFPortPhysAdminStatus
    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 { fcFxFPortCapFcphVersionHigh, fcFxFPortCapFcphVersionLow,
               fcFxFPortCapBbCreditMax, fcFxFPortCapBbCreditMin,
               fcFxFPortCapRxDataFieldSizeMax,
               fcFxFPortCapRxDataFieldSizeMin,
               fcFxFPortCapCos, fcFxFPortCapIntermix,
               fcFxFPortCapStackedConnMode, fcFxFPortCapClass2SeqDeliv,
               fcFxFPortCapClass3SeqDeliv, fcFxFPortCapHoldTimeMax,
               fcFxFPortCapHoldTimeMin
            }
    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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6. Acknowledgements

The editors would like to thank the following individuals for their assistance and constructive comments:

Juergen Schoenwaelder, Technical University Braunschweig	
Vincent Guan, Brocade	Gavin Bowlby, Gadzoox
Bent Stoevhase, Brocade	Jeff Meyer, HP
John Y. Chu, IBM	
Yakov Rekhter, Cisco	Martin Sachs, IBM
Dan Eisenhauer, IBM	Beth Vanderbeck, IBM
Carl Zeitler, Compaq	Paul Griffiths, IBM
KC Chennappan, IBM	Jessie Haug, IBM
Bob Cornelius, ANCOR	Lansing Sloan, LLNL
Paul Rupert, LLNL	Rich Taborak, NSerial
Steve Wilson, Brocade	Jerry Rouse, IBM
Dal Allan, ENDL	Hubert Huot, IBM
Venkat Rao, HP	Amir Artsi, RADWAY International Ltd.

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Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

