

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.

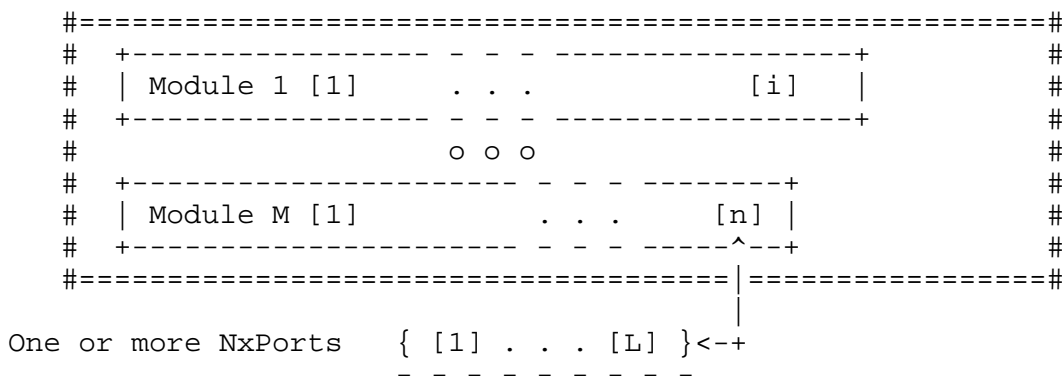
Each module is uniquely identified by a module number in the range of 1 through `fcFeModuleCapacity` inclusive. Modules may come and go without causing a management reset (of `sysUpTime`), and may be sparsely numbered within the Fabric Element. That is, the module numbering is not required to be contiguous.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

```
::= { 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
        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 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."

::= { 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 FxPort 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 FxPort 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 FxPort 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 FxPort 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 FxPort."
::= { 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."
    ::= { 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 FxpPort 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 FxpPort
        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 FxpPort 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 FxpPort 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,
        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."
 ::= { 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,
fcFxpPortNxPortRxDatFieldSize, 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, fcFxpPortInvalidCrcls,
              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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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.

7. References

7.1. IETF References

- [1] Harrington, D., Presuhn, R. and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.
- [2] Rose, M. and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.
- [3] Rose, M. and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.
- [4] Rose, M., "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.
- [5] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.
- [6] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.
- [7] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.
- [8] Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.
- [9] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.
- [10] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1906, January 1996.
- [11] Case, J., Harrington D., Presuhn R. and B. Wijnen, "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.
- [12] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.

- [13] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.
- [14] Levi, D., Meyer, P. and B. Stewart, "SNMPv3 Applications", RFC 2573, April 1999.
- [15] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.
- [16] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction to Version 3 of the Internet-standard Network Management Framework", RFC 2570, April 1999.

7.2. Approved ANSI/NCITS References

- [17] Fibre Channel Physical and Signaling Interface (FC-PH), American National Standard for Information Systems X3.230:1994, Computer and Business Equipment Manufacturers Association, Washington, DC.
- [18] Fibre Channel Fabric Generic (FC-FG), American National Standard for Information Systems X3.289:1996, Computer and Business Equipment Manufacturers Association, Washington, DC.
- [19] Fibre Channel Generic Services (FC-GS), American National Standard for Information Systems X3.288:1996, Computer and Business Equipment Manufacturers Association, Washington, DC.
- [20] Fibre Channel Arbitrated Loop (FC-AL), American National Standard for Information Systems X3.272:1996, Computer and Business Equipment Manufacturers Association, Washington, DC.
- [21] Fibre Channel Physical and Signaling Interface-2 (FC-PH-2), American National Standard for Information Systems, X3.297:1997, Computer and Business Equipment Manufacturers Association, Washington, DC.
- [22] Fibre Channel Physical and Signaling Interface-3 (FC-PH-3), American National Standard for Information Systems, X3.303:1998, Computer and Business Equipment Manufacturers Association, Washington, DC.
- [23] Fibre Channel Switch Fabric (FC-SW), American National Standard for Information Systems, NCITS 321:1998, Computer and Business Equipment Manufacturers Association, Washington, DC.

7.3. ANSI/NCITS References Under Development

- [24] Fibre Channel Arbitrated Loop-2 (FC-AL-2), American National Standard for Information Systems, X3T11/1133D Rev 5.2, Computer and Business Equipment Manufacturers Association, Washington, DC.

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Acknowledgement

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

