

Internet Draft

Keith McCloghrie
Cisco Systems, Inc
17 December 2004

Fibre Channel Management MIB
draft-ietf-ips-fcmgmt-mib-06.txt

Status of this Memo

By submitting this Internet-Draft, I certify that any applicable patent or other IPR claims of which I am aware have been disclosed, and any of which I become aware will be disclosed, in accordance with [RFC 3668](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet- Drafts as reference material or to cite them other than as "work in progress".

The list of current Internet-Drafts can be accessed at
<http://www.ietf.org/ietf/lid-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at
<http://www.ietf.org/shadow.html>.

Copyright Notice

Copyright (C) The Internet Society (2004). All Rights Reserved.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for information related to Fibre Channel.

Internet Draft

Fibre Channel Management MIB

December 2004

Table of Contents

1	Introduction	3
2	The Internet-Standard Management Framework	3
3	Short Overview of Fibre Channel	3
4	MIB Overview	4
4.1	The fcmInstanceBasicGroup group	4
4.2	The fcmSwitchBasicGroup group	4
4.3	The fcmPortBasicGroup group	4
4.4	The fcmPortStatsGroup group	5
4.5	The fcmPortClass23StatsGroup group	5
4.6	The fcmPortLcStatsGroup group	5
4.7	The fcmPortClassFStatsGroup group	5
4.8	The fcmPortErrorsGroup group	5
4.9	The fcmSwitchPortGroup group	5
4.10	The fcmSwitchLoginGroup group	6
4.11	The fcmLinkBasicGroup group	6
5	Relationship to Other MIBs	6
5.1	The Interfaces Group MIB	6
5.2	Entity MIB	9
5.3	Host Resources MIB	10
6	Definitions	11
7	Intellectual Property	63
8	Acknowledgements	63
9	Normative References	63
10	Informative References	65
11	Security Considerations	66
12	IANA Considerations	67
12.1	OID Assignment	67
12.2	FC Port Type Registry	67
13	Comparison to draft-ietf-ipfc-fcmgmt-int-mib-07.txt	70
14	Comparison to RFC 2837	77
15	Author's Address	78
16	Full Copyright Statement	78

Internet Draft

Fibre Channel Management MIB

December 2004

1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for information related to Fibre Channel.

2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7](#) of RFC [3410](#) [[RFC3410](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

3. Short Overview of Fibre Channel

The Fibre Channel (FC) is logically a bidirectional point-to-point serial data channel, structured for high performance capability. The Fibre Channel provides a general transport vehicle for higher level protocols such as Intelligent Peripheral Interface (IPI) and Small Computer System Interface (SCSI) command sets, the High-Performance Parallel Interface (HIPPI) data framing, IP (Internet Protocol), IEEE 802.2, and others.

Physically, Fibre Channel is an interconnection of multiple communication points, called N_Ports, interconnected either by a switching network, called a Fabric, or by a point-to-point link. A Fibre Channel "node" consists of one or more N_Ports. A Fabric may consist of multiple Interconnect Elements, some of which are switches. An N_Port connects to the Fabric via a port on a switch called an

F_Port. When multiple FC nodes are connected to a single port on a switch via an "Arbitrated Loop" topology, the switch port is called an FL_Port, and the nodes' ports are called NL_Ports. The term Nx_Port is used to refer to either an N_Port or an NL_port. The term Fx_Port is used to refer to either an F_Port or an FL_port. A switch port, which is interconnected to another switch port via an Inter Element Link (IEL), is called an E_Port. A B_Port connects a bridge device with an E_Port on a switch; a B_Port provides a subset of E_Port functionality.

Expires June 2005

[Page 3]

Internet Draft

Fibre Channel Management MIB

December 2004

Many Fibre Channel components, including the fabric, each node, and most ports, have globally-unique names. These globally-unique names are typically formatted as World Wide Names (WWNs). More information on WWNs can be found in [\[WWN1\]](#) and [\[WWN2\]](#). WWNs are expected to be persistent across agent and unit resets.

Fibre Channel frames contain 24-bit address identifiers which identify the frame's source and destination ports. Each FC port has an address identifier and a WWN. When a fabric is in use, the FC address identifiers are dynamic and are assigned by a switch.

[4.](#) MIB Overview

This MIB contains the notion of a Fibre Channel management instance, which is defined as a separable managed instance of Fibre Channel functionality. Fibre Channel functionality may be grouped into Fibre Channel management instances in whatever way is most convenient for the implementation(s). For example, one such grouping accommodates a single SNMP agent having multiple AgentX [\[RFC2741\]](#) sub-agents, with each sub-agent implementing a different Fibre Channel management instance. In order to represent such multiple Fibre Channel management instances within the same SNMP context (see [section 3.3.1 of \[RFC3411\]](#)), all tables in this MIB are INDEX-ed by fcmInstanceIndex which is defined as an arbitrary integer to uniquely identify a particular Fibre Channel management instance.

This MIB contains eleven MIB groups, as follows.

[4.1.](#) The fcmInstanceBasicGroup group

This group contains basic information about a Fibre Channel managed

instance, including its name and description, the Fibre Channel function(s) it performs, and optional pointers to hardware and/or software components.

[4.2.](#) The fcmSwitchBasicGroup group

This group contains basic information about a Fibre Channel switch, including its domain-id and whether it is the principal switch of its fabric.

[4.3.](#) The fcmPortBasicGroup group

This group contains basic information about a Fibre Channel port, including its port name (WWN), the name of the node (if any) of which it

is a part, the type of port, the classes of service it supports, its transmitter and connector types, and the higher level protocols it supports.

Each Fibre Channel port is represented by an entry in the ifTable (see below). The tables relating to ports in this MIB are indexed by the port's value of ifIndex.

[4.4.](#) The fcmPortStatsGroup group

This group contains traffic statistics, which are not specific to any particular class of service, for Fibre Channel ports.

[4.5.](#) The fcmPortClass23StatsGroup group

This group contains traffic statistics which are specific to Class 2 or Class 3 traffic on Fibre Channel ports, including class-specific frame and octet counters and counters of busy and reject frames.

[4.6.](#) The fcmPortLcStatsGroup group

Some of the statistics in the fcmPortClass23StatsGroup can increase rapidly enough to warrant them being defined using the Counter64 syntax. However, some old SNMP systems do not (yet) support Counter64 objects. Thus, this group defines low-capacity (Counter32-based) equivalents for

the Counter64-based statistics in the fcmPortClass23StatsGroup group.

[4.7.](#) The fcmPortClassFStatsGroup group

This group contains traffic statistics which are specific to Class F traffic on the E_Ports of a Fibre Channel switch.

[4.8.](#) The fcmPortErrorsGroup group

This group contains counters of various error conditions which can occur on Fibre Channel ports.

[4.9.](#) The fcmSwitchPortGroup group

This group contains information about ports on a Fibre Channel switch. For an Fx_Port, it includes the port's timeout values, its hold-time, and its capabilities in terms of maximum and minimum buffer-to-buffer credit allocations, maximum and minimum data field size, and support for class 2 and class 3 sequenced delivery. For an E_Port or B_Port, it includes the buffer-to-buffer credit allocation and data field size.

Expires June 2005

[Page 5]

Internet Draft

Fibre Channel Management MIB

December 2004

[4.10.](#) The fcmSwitchLoginGroup group

This group contains information, known to a Fibre Channel switch, about its attached/logged-in Nx_Ports and the service parameters which have been agreed with them.

[4.11.](#) The fcmLinkBasicGroup group

This group contains information, known to a local Fibre Channel management instance, about Fibre Channel links, including links which terminate locally.

[5.](#) Relationship to Other MIBs

This MIB is a replacement for two other MIBs: [RFC 2837](#), and the Fibre Channel Management Integration MIB which was originally submitted as an Internet Draft to the IETF's IPFC Working Group as [draft-ietf-ipfc-fcmgmt-int-mib-0n.txt](#).

[5.1.](#) The Interfaces Group MIB

The Interfaces Group MIB [[RFC2863](#)] contains generic information about all lower layer interfaces, i.e., interfaces which are (potentially) below the internet layer. Thus, each Fibre Channel port should have its own row in the ifTable, and that row will contain the generic information about the interface/port. The Interfaces Group MIB specifies that additional information which is specific to a particular type of interface media, should be defined in a media-specific MIB. This MIB is the media-specific MIB for Fibre Channel ports/interfaces.

[Section 4 of \[RFC2863\]](#) requires that a media-specific MIB clarify how the generic definitions apply for the particular type of media. The clarifications for Fibre Channel interfaces are as follows.

[5.1.1.](#) Layering Model

The Interfaces Group MIB permits multiple ifTable entries to be defined for interface sub-layers, and for those multiple entries to be arranged in a stack.

For Fibre Channel interfaces, no sublayers are defined and a Fibre Channel interface will typically have no other ifTable rows stacked on top of it, nor underneath it.

[5.1.2.](#) Virtual Circuits

This Fibre Channel MIB does not deal with virtual circuits.

[5.1.3.](#) ifRcvAddressTable

The ifRcvAddressTable does not apply to Fibre Channel interfaces.

[5.1.4.](#) ifType

The value of ifType for a Fibre Channel interface is 56.

[5.1.5.](#) ifXxxOctets

The definitions of ifInOctets and ifOutOctets (and similarly, ifHCInOctets and ifHCOctets) specify that their values include framing characters. For Fibre Channel interfaces, they include all the octets contained in frames between the Start-of-Frame and End-of-Frame delimiters (excluding the delimiters).

[5.1.6](#). Specific Interface Group MIB Objects

The following table provides specific implementation guidelines for applying the objects defined in the Interfaces Group MIB to Fibre Channel interfaces. For those objects not listed here, refer to their generic definitions in [[RFC2863](#)]. ([RFC 2863](#) takes precedence over these guidelines in the event of any conflict.)

Object	Guidelines
ifType	56
ifMtu	The MTU as seen by a higher layer protocol, like IP. That is, when IP is running over the interface, this object is the size of the largest IP datagram that can be sent/received over the interface.
ifSpeed	For 1Gbs, this will be 1,000,000,000; for 2Gbs, it will be 2,000,000,000. If auto-negotiation is implemented and enabled on an interface, and the interface has not yet negotiated to an operational speed, this object SHOULD reflect the maximum speed supported by the interface.

ifPhysAddress	The interface's 24-bit Fibre Channel Address Identifier, or the zero-length string if no Address Identifier has been assigned to the interface.
ifAdminStatus	Write access is not required, and support for 'testing' is not required.

ifOperStatus	Support for 'testing' is not required. The value 'dormant' has no meaning for Fibre Channel interfaces.
ifInOctets ifHCInOctets	The number of octets of information contained in received frames between the Start-of-Frame and End-of-Frame delimiters (excluding the delimiters).
ifInUcastPkts ifHCInUcastPkts	The number of unicast frames received, i.e., the number of Start-of-Frame delimiters received for unicast frames.
ifInErrors	<p>The sum for this interface of</p> <ul style="list-style-type: none"> fcmPidLossOfSynchs fcmPidLossOfSignals fcmPidPrimSeqProtocolErrors fcmPidInvalidTxWords fcmPidInvalidCRCs fcmPidAddressErrors fcmPidDelimiterErrors fcmPidTruncatedFrames fcmPidEncodingDisparityErrors <p>plus any errors in fcmPidOtherErrors which were input errors.</p>
ifOutOctets ifHCOctets	The number of octets of information contained in transmitted frames between the Start-of-Frame and End-of-Frame delimiters (excluding the delimiters).
ifOutUcastPkts ifHCOctets	The number of frames transmitted, i.e., the number of start-of-frame delimiters transmitted for unicast frames.

ifOutErrors	This is the number of errors in
-------------	---------------------------------

	fcmPortOtherErrors which were output errors.
ifInMulticastPkts ifInBroadcastPkts ifOutMulticastPkts ifOutBroadcastPkts ifHCInMulticastPkts ifHCInBroadcastPkts ifHCOutMulticastPkts ifHCOutBroadcastPkts	These counters are not incremented (unless a proprietary mechanism for multicast/broadcast is supported).
ifLinkUpDownTrapEnable	Refer to [RFC2863]. Default is 'enabled'
ifHighSpeed	The current operational speed of the interface in millions of bits per second. For 1Gbs, this will be 1000; for 2Gbs, it will be 2000. If auto-negotiation is implemented and enabled on an interface, and the interface has not yet negotiated to an operational speed, this object SHOULD reflect the maximum speed supported by the interface.
ifPromiscuousMode	This will normally be 'false'
ifConnectorPresent	This will normally be 'true'.

[5.2](#). Entity MIB

The Entity MIB [[RFC2737](#)] contains information about individual physical components and any hierarchical relationship which may exist between them. Any Fibre Channel management instance with a relationship to a physical component (or to a hierarchy of physical components) will have its value of the fcmInstancePhysicalIndex object contain a pointer to the relevant row in the Entity MIB. If there is no correspondence to a physical component (or said component does not have a row in the Entity MIB), then the value of fcmInstancePhysicalIndex is zero. (Note that an implementation is not required to support a non-zero value of fcmInstancePhysicalIndex.)

[5.3.](#) Host Resources MIB

The Host Resources MIB [[RFC2790](#)] includes information about installed software modules. Any Fibre Channel management instance with a correspondence to a software module, will have its value of the fcmInstanceSoftwareIndex object contain a pointer to the relevant row in the Host Resources MIB. If there is no correspondence to a software module (or said software module does not has a row in the Host Resources MIB), then the value of fcmInstanceSoftwareIndex is zero. (Note that an agent implementation is not required to support a non-zero value of fcmInstanceSoftwareIndex.)

Internet Draft

Fibre Channel Management MIB

December 2004

6. Definitions

```
FC-MGMT-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE,
    Integer32, Unsigned32, Counter32, Counter64, transmission
        FROM SNMPv2-SMI
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF
    TruthValue, TEXTUAL-CONVENTION
        FROM SNMPv2-TC
    ifIndex
        FROM IF-MIB
    SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB;
```

```
fcMgmtMIB MODULE-IDENTITY
```

```
    LAST-UPDATED      "200412140000Z"
    ORGANIZATION      "IETF IPS (IP-Storage) Working Group"
    CONTACT-INFO
        "
            Keith McCloghrie
            Cisco Systems, Inc.
            Tel: +1 408 526-5260
            E-mail: kzm@cisco.com
            Postal: 170 West Tasman Drive
                   San Jose, CA USA 95134
        "
```

```
    DESCRIPTION
```

```
        "This module defines management information specific to
        Fibre Channel-attached devices.
```

```

        Copyright (C) The Internet Society (2004).  This version of
        this MIB module is part of RFC yyyy;  see the RFC itself for
        full legal notices."
```

```
-- RFC Ed.: replace yyyy with actual RFC number & remove this note
```

```
    REVISION          "200412140000Z"
```

```
    DESCRIPTION
```

```
        "Initial version of the Fibre Channel Mgmt MIB module."
```

```
    ::= { transmission nnn } -- IANA, please enter the value you assign here
```

```
fcmgmtObjects        OBJECT IDENTIFIER ::= { fcMgmtMIB 1 }
```

```
fcmgmtNotifications OBJECT IDENTIFIER ::= { fcMgmtMIB 2 }
```

fcmgmtNotifPrefix OBJECT IDENTIFIER ::= { fcmgmtNotifications 0 }
fcmgmtConformance OBJECT IDENTIFIER ::= { fcMgmtMIB 3 }

Expires June 2005

[Page 11]

Internet Draft

Fibre Channel Management MIB

December 2004

--*****
-- Textual Conventions
--

FcNameIdOrZero ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The World Wide Name (WWN) associated with a Fibre Channel (FC) entity. WWNs were initially defined as 64-bits in length. The latest definition (for future use) is 128-bits long. The zero-length string value is used in circumstances where the WWN is unassigned/unknown."

SYNTAX OCTET STRING (SIZE(0 | 8 | 16))

FcAddressIdOrZero ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A Fibre Channel Address ID, a 24-bit value unique within the address space of a Fabric. The zero-length string value is used in circumstances where the WWN is unassigned/unknown."

SYNTAX OCTET STRING (SIZE(0 | 3))

FcDomainIdOrZero ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The Domain Id (of a FC switch), or zero if the no Domain Id has been assigned."

SYNTAX Integer32 (0..239)

FcPortType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The type of a Fibre Channel port, as indicated by the use of the appropriate value assigned by IANA."

REFERENCE

"The IANA-maintained registry for
Fibre Channel port types. "

-- IANA, please extend the text inside the immediately
-- preceeding quotes to include a location at which a
-- reader can ascertain the latest assigned values

SYNTAX Unsigned32

Expires June 2005

[Page 12]

Internet Draft

Fibre Channel Management MIB

December 2004

FcClasses ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A set of Fibre Channel classes of service."

REFERENCE

"Classes of service are described in FC-FS [Section 13](#)."

SYNTAX BITS { classF(0), class1(1), class2(2), class3(3),
class4(4), class5(5), class6(6) }

FcBbCredit ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The buffer-to-buffer credit of an FC port."

SYNTAX Integer32 (0..32767)

FcBbCreditModel ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The buffer-to-buffer credit model of an Fx_Port."

SYNTAX INTEGER { regular(1), alternate (2) }

FcDataFieldSize ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The Receive Data Field Size associated with an FC port."

SYNTAX Integer32 (128..2112)

Internet Draft

Fibre Channel Management MIB

December 2004

FcUnitFunctions ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A set of functions that a Fibre Channel Interconnect Element or Platform might perform. A value with no bits set, indicates the function(s) are unknown. The individual bits have the following meanings:

other - none of the following.

hub - a device that interconnects L_Ports, but does not operate as an FL_Port.

switch - a fabric element conforming to the Fibre Channel switch fabric set of standards (e.g., FC-SW, FC-SW-2).

bridge - a device that encapsulates Fibre Channel frames within another protocol (e.g., FC-BB, FC-BB-2).

gateway - a device that converts an FC-4 to another protocol (e.g., FCP to iSCSI).

host - a computer system that provides end users services

such as computation and storage access.

storageSubsys - an integrated collection of storage controllers, storage devices, and necessary software, that provides storage services to one or more hosts.

storageAccessDev - a device that provides storage management and access for heterogeneous hosts and heterogeneous devices (e.g., medium changer).

nas - a device that connects to a network and provides file access services.

wdmux - a device that modulates/demodulates each of several data streams (e.g., Fibre Channel protocol data streams) onto/from a different part of the light spectrum in an optical fiber.

storageDevice - a disk/tape/etc. device (without the controller and/or software required for it to be a 'storageSubsys')."

SYNTAX BITS {

```
        other(0),          -- none of the following
        hub(1),
        switch(2),
        bridge(3),
        gateway(4),
        host(5),
        storageSubsys(6),
        storageAccessDev(7),
        nas(8),
        wdmux(9),
        storageDevice(10)
    }
```



```
--*****
-- MIB object definitions
--
```

```
fcmInstanceTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcmInstanceEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about the local Fibre Channel management
        instances."
```

```

 ::= { fcmgmtObjects 1 }

fcmInstanceEntry OBJECT-TYPE
    SYNTAX      FcmInstanceEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A list of attributes for a particular local Fibre Channel
        management instance."
    INDEX { fcmInstanceIndex }
    ::= { fcmInstanceTable 1 }

FcmInstanceEntry ::=
    SEQUENCE {
        fcmInstanceIndex          Unsigned32,
        fcmInstanceWwn            FcNameIdOrZero,
        fcmInstanceFunctions      FcUnitFunctions,
        fcmInstancePhysicalIndex  Integer32,
        fcmInstanceSoftwareIndex  Integer32,
        fcmInstanceStatus         INTEGER,
        fcmInstanceTextName       SnmpAdminString,
        fcmInstanceDescr          SnmpAdminString,
        fcmInstanceFabricId       FcNameIdOrZero
    }

fcmInstanceIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer value which uniquely identifies this
        instance amongst all local Fibre Channel management
        instances."

```

It is mandatory to keep this value constant between restarts of the agent, and to make every possible effort to keep it constant across restarts (but note, it is unrealistic to expect it to remain constant across all re-configurations of the local system, e.g., across the replacement of all non-

```

        volatile storage)."
 ::= { fcmInstanceEntry 1 }

fcmInstanceWwn OBJECT-TYPE
    SYNTAX      FcNameIdOrZero
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "If the instance has one (or more) WWN(s), then this object
        contains that (or one of those) WWN(s).

        If the instance does not have a WWN associated with it, then
        this object contains the zero-length string."
 ::= { fcmInstanceEntry 2 }

fcmInstanceFunctions OBJECT-TYPE
    SYNTAX      FcUnitFunctions
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "One (or more) Fibre Channel unit functions being performed
        by this instance."
 ::= { fcmInstanceEntry 3 }

fcmInstancePhysicalIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "If this management instance corresponds to a physical
        component (or to a hierarchy of physical components)
        identified by the Entity-MIB, then this object's value is
        the value of the entPhysicalIndex of that component (or of
        the component at the root of that hierarchy). If there is
        no correspondence to a physical component (or no component
        which has an entPhysicalIndex value), then the value of this
        object is zero."
    REFERENCE
        "entPhysicalIndex is defined in the Entity MIB, RFC 2737."
 ::= { fcmInstanceEntry 4 }

```

fcmInstanceSoftwareIndex OBJECT-TYPE

SYNTAX Integer32 (0..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If this management instance corresponds to an installed software module identified in the Host Resources MIB, then this object's value is the value of the hrSWInstalledIndex of that module. If there is no correspondence to an installed software module (or no module which has a hrSWInstalledIndex value), then the value of this object is zero."

REFERENCE

"hrSWInstalledIndex is defined in the Host Resources MIB,
[RFC 2790](#)"

::= { fcmInstanceEntry 5 }

fcmInstanceStatus OBJECT-TYPE

SYNTAX INTEGER {
 unknown(1),
 ok(2), -- able to operate correctly
 warning(3), -- needs attention
 failed(4) -- something has failed
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Overall status of the Fibre Channel entity/entities managed by this management instance. The value should reflect the most serious status of such entities."

::= { fcmInstanceEntry 6 }

fcmInstanceTextName OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..79))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A textual name for this management instance and the Fibre Channel entity/entities that it is managing."

::= { fcmInstanceEntry 7 }

fcmInstanceDescr OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-write

STATUS current

Internet Draft

Fibre Channel Management MIB

December 2004

DESCRIPTION

"A textual description of this management instance and the Fibre Channel entity/entities that it is managing."

::= { fcmInstanceEntry 8 }

fcmInstanceFabricId OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The globally unique Fabric Identifier which identifies the fabric to which the Fibre Channel entity/entities managed by this management instance are connected, or, of which they are a part. This is typically the Node WWN of the principal switch of a Fibre Channel fabric. The zero-length string indicates that the fabric identifier is unknown (or not applicable)."

In the event that the Fibre Channel entity/entities managed by this management instance is/are connected to multiple fabrics, then this object records the first (known) one."

::= { fcmInstanceEntry 9 }

--*****

-- The Fibre Channel Switch Table

--

fcmSwitchTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcmSwitchEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of information about Fibre Channel switches which are managed by Fibre Channel management instances. Each Fibre Channel management instance can manage one or more Fibre Channel switches."

::= { fcmgmtObjects 2 }

fcmSwitchEntry OBJECT-TYPE

SYNTAX FcmSwitchEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information about a particular Fibre Channel switch which

Expires June 2005

[Page 19]

Internet Draft

Fibre Channel Management MIB

December 2004

is managed by the management instance given by
fcmInstanceId."

INDEX { fcmInstanceId, fcmSwitchIndex }
 ::= { fcmSwitchTable 1 }

FcmSwitchEntry ::=

SEQUENCE {
 fcmSwitchIndex Unsigned32,
 fcmSwitchDomainId FcDomainIdOrZero,
 fcmSwitchPrincipal TruthValue,
 fcmSwitchWWN FcNameIdOrZero
}

fcmSwitchIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"An arbitrary integer which uniquely identifies a Fibre
Channel switch amongst those managed by one Fibre Channel
management instance.

It is mandatory to keep this value constant between restarts
of the agent, and to make every possible effort to keep it
constant across restarts."

::= { fcmSwitchEntry 1 }

fcmSwitchDomainId OBJECT-TYPE

SYNTAX FcDomainIdOrZero
MAX-ACCESS read-write
STATUS current
DESCRIPTION

"The Domain Id of this switch. A value of zero indicates
that a switch has not (yet) been assigned a Domain Id."

::= { fcmSwitchEntry 2 }

fcmSwitchPrincipal OBJECT-TYPE

```

SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "An indication of whether this switch is the principal
    switch within its fabric."
 ::= { fcmSwitchEntry 3 }

```

Expires June 2005

[Page 20]

Internet Draft

Fibre Channel Management MIB

December 2004

```

fcmSwitchWWN  OBJECT-TYPE
    SYNTAX      FcNameIdOrZero
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The World Wide Name of this switch."
    ::= { fcmSwitchEntry 4 }

```

```

--*****
-- The Fibre Channel Port Table
--

```

```

fcmPortTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcmPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about Fibre Channel ports.  Each Fibre Channel
        port is represented by one entry in the IF-MIB's ifTable."
    REFERENCE
        "RFC 2863, The Interfaces Group MIB, June 2000."
    ::= { fcmgmtObjects 3 }

```

```

fcmPortEntry OBJECT-TYPE
    SYNTAX      FcmPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Each entry contains information about a specific port."
    INDEX { ifIndex }
    ::= { fcmPortTable 1 }

```

```

FcmPortEntry ::=
    SEQUENCE {
        fcmPortInstanceIndex    Unsigned32,
        fcmPortWwn              FcNameIdOrZero,
        fcmPortNodeWwn          FcNameIdOrZero,
        fcmPortAdminType        FcPortType,
        fcmPortOperType         FcPortType,
        fcmPortFcCapClass        FcClasses,
        fcmPortFcOperClass       FcClasses,
        fcmPortTransmitterType   INTEGER,
        fcmPortConnectorType     INTEGER,
        fcmPortSerialNumber      SnmpAdminString,
        fcmPortPhysicalNumber    Unsigned32,
    }

```

Expires June 2005

[Page 21]

Internet Draft

Fibre Channel Management MIB

December 2004

```

        fcmPortAdminSpeed      INTEGER,
        fcmPortCapProtocols     BITS,
        fcmPortOperProtocols    BITS
    }

```

fcmPortInstanceIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of fcmInstanceIndex by which the Fibre Channel management instance, which manages this port, is identified in the fcmInstanceTable."

::= { fcmPortEntry 1 }

fcmPortWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The World Wide Name of the port, or the zero-length string if the port does not have a WWN."

::= { fcmPortEntry 2 }

fcmPortNodeWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The World Wide Name of the Node which contains this port,
or the zero-length string if the port does not have a node
WWN."

::= { fcmPortEntry 3 }

fcmPortAdminType OBJECT-TYPE

SYNTAX FcPortType

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The administratively desired type of this port."

::= { fcmPortEntry 4 }

fcmPortOperType OBJECT-TYPE

SYNTAX FcPortType

MAX-ACCESS read-only

Expires June 2005

[Page 22]

Internet Draft

Fibre Channel Management MIB

December 2004

STATUS current

DESCRIPTION

"The current operational type of this port."

::= { fcmPortEntry 5 }

fcmPortFcCapClass OBJECT-TYPE

SYNTAX FcClasses

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The classes of service capability of this port."

::= { fcmPortEntry 6 }

fcmPortFcOperClass OBJECT-TYPE

SYNTAX FcClasses

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The classes of service that are currently operational on

this port. For an FL_Port, this is the union of the classes
 being supported across all attached NL_Ports."
 ::= { fcmPortEntry 7 }

fcmPortTransmitterType OBJECT-TYPE

```
SYNTAX      INTEGER {
    unknown(1),
    other(2),
    shortwave850nm(3),
    longwave1550nm(4),
    longwave1310nm(5),
    electrical(6)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The technology of the port transceiver."
REFERENCE
    "FC-GS-3, section 6.1.2.2.3"
 ::= { fcmPortEntry 8 }
```

fcmPortConnectorType OBJECT-TYPE

```
SYNTAX      INTEGER {
    unknown(1),
    other(2),
    gbic(3),
```

Expires June 2005

[Page 23]

Internet Draft

Fibre Channel Management MIB

December 2004

```
    embedded(4),
    glm(5),
    gbicSerialId(6),
    gbicNoSerialId(7),
    sfpSerialId(8),
    sfpNoSerialId(9)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The module type of the port connector. This object refers
    to the hardware implementation of the port. It will be
    'embedded' if the hardware equivalent to Gigabit interface
```

card (GBIC) is part of the line card and is unremovable. It will be 'glm' if it's a gigabit link module (GLM). It will be 'gbicSerialId' if the GBIC serial id can be read, else it will be 'gbicNoSerialId'. It will be 'sfpSerialId', if the small form factor (SFP) pluggable GBICs serial id can be read, else it will be 'sfpNoSerialId'."

REFERENCE

"FC-GS-3, [section 6.1.2.2.4](#)"
 ::= { fcmPortEntry 9 }

fcmPortSerialNumber OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The serial number associated with the port (e.g., for a GBIC). If not applicable, the object's value is a zero-length string."

REFERENCE

"FC-GS-3, [section 6.1.2.2.4](#)"
 ::= { fcmPortEntry 10 }

fcmPortPhysicalNumber OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is the port's 'Physical Port Number' as defined by GS-3."

REFERENCE

"FC-GS-3, [section 6.1.2.2.5](#)"
 ::= { fcmPortEntry 11 }

fcmPortAdminSpeed OBJECT-TYPE

SYNTAX INTEGER {
 auto(1),
 eighthGbs(2), -- 125Mbps
 quarterGbs(3), -- 250Mbps
 halfGbs(4), -- 500Mbps
 oneGbs(5), -- 1Gbs

```

                twoGbs(6),      -- 2Gbs
                fourGbs(7),    -- 4Gbs
                tenGbs(8)      -- 10Gbs
            }
MAX-ACCESS read-write
STATUS current
DESCRIPTION
    "The speed of the interface:

        'auto'          - auto-negotiation
        'tenGbs'        - 10Gbs
        'fourGbs'       - 4Gbs
        'twoGbs'        - 2Gbs
        'oneGbs'        - 1Gbs
        'halfGbs'       - 500Mbps
        'quarterGbs'    - 250Mbps
        'eighthGbs'     - 125Mbps"
 ::= { fcmPortEntry 12 }

fcmPortCapProtocols OBJECT-TYPE
SYNTAX      BITS {
                unknown(0),
                loop(1),
                fabric(2),
                scsi(3),
                tcpIp(4),
                vi(5),
                ficon(6)
            }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "A bit mask specifying the higher level protocols which are
    capable of being running over this port. Note that for
    generic Fx_Ports, E_Ports and B_Ports, this object will
    indicate all protocols."
 ::= { fcmPortEntry 13 }

```

```

SYNTAX      BITS {
                unknown(0),
                loop(1),
                fabric(2),
                scsi(3),
                tcpIp(4),
                vi(5),
                ficon(6)
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A bit mask specifying the higher level protocols which are
    currently operational on this port.  For Fx_Ports, E_Ports
    and B_Ports, this object will typically have the value
    'unknown'."
 ::= { fcmPortEntry 14 }

--*****
-- Port Statistics
--

fcmPortStatsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcmPortStatsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A list of statistics for Fibre Channel ports."
    ::= { fcmgmtObjects 4 }

fcmPortStatsEntry OBJECT-TYPE
    SYNTAX      FcmPortStatsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry containing statistics for a Fibre Channel port.
        If any counter in this table suffers a discontinuity, the
        value of ifCounterDiscontinuityTime (defined in the IF-MIB)
        must be updated."
    REFERENCE   "The Interfaces Group MIB, RFC 2863, June 2000."
    AUGMENTS    { fcmPortEntry }
    ::= { fcmPortStatsTable 1 }

```

FcmPortStatsEntry ::=

```
SEQUENCE {
    fcmPortBBCreditZeros      Counter64,
    fcmPortFullInputBuffers   Counter64,
    fcmPortClass2RxFrames     Counter64,
    fcmPortClass2RxOctets     Counter64,
    fcmPortClass2TxFrames     Counter64,
    fcmPortClass2TxOctets     Counter64,
    fcmPortClass2Discards     Counter64,
    fcmPortClass2RxFbsyFrames Counter64,
    fcmPortClass2RXPbsyFrames Counter64,
    fcmPortClass2RxFrjtFrames Counter64,
    fcmPortClass2RxPrjtFrames Counter64,
    fcmPortClass2TxFbsyFrames Counter64,
    fcmPortClass2TxPbsyFrames Counter64,
    fcmPortClass2TxFrjtFrames Counter64,
    fcmPortClass2TxPrjtFrames Counter64,
    fcmPortClass3RxFrames     Counter64,
    fcmPortClass3RxOctets     Counter64,
    fcmPortClass3TxFrames     Counter64,
    fcmPortClass3TxOctets     Counter64,
    fcmPortClass3Discards     Counter64,
    fcmPortClassFRxFrames     Counter32,
    fcmPortClassFRxOctets     Counter32,
    fcmPortClassFTxFrames     Counter32,
    fcmPortClassFTxOctets     Counter32,
    fcmPortClassFDiscards     Counter32
}
```

fcmPortBBCreditZeros OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of transitions in/out of the buffer-to-buffer credit zero state. The other side is not providing any credit."

::= { fcmPortStatsEntry 1 }

fcmPortFullInputBuffers OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of occurrences when all input buffers of a port

Internet Draft

Fibre Channel Management MIB

December 2004

were full and outbound buffer-to-buffer credit transitioned to zero, i.e., there became no credit to provide to other side."

::= { fcmPortStatsEntry 2 }

fcmPortClass2RxFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Class 2 frames received at this port."

::= { fcmPortStatsEntry 3 }

fcmPortClass2RxOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of octets contained in Class 2 frames received at this port."

::= { fcmPortStatsEntry 4 }

fcmPortClass2TxFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Class 2 frames transmitted out of this port."

::= { fcmPortStatsEntry 5 }

fcmPortClass2TxOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of octets contained in Class 2 frames transmitted out of this port."

::= { fcmPortStatsEntry 6 }

fcmPortClass2Discards OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The number of Class 2 frames that were discarded upon

Expires June 2005

[Page 28]

Internet Draft

Fibre Channel Management MIB

December 2004

reception at this port."
 ::= { fcmPortStatsEntry 7 }

fcmPortClass2RxFbsyFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that F_BSY was returned to this port as a result of a Class 2 frame that could not be delivered to the other end of the link. This can occur when either the fabric or the destination port is temporarily busy. Note that this counter will never increment for an F_Port."

::= { fcmPortStatsEntry 8 }

fcmPortClass2RxBpsyFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that P_BSY was returned to this port as a result of a Class 2 frame that could not be delivered to the other end of the link. This can occur when the destination port is temporarily busy."

::= { fcmPortStatsEntry 9 }

fcmPortClass2RxFrjtFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that F_RJT was returned to this port as a result of a Class 2 frame that was rejected by the fabric. Note that this counter will never increment for an F_Port."

::= { fcmPortStatsEntry 10 }

fcmPortClass2RxPrjtFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that P_RJT was returned to this port as a result of a Class 2 frame that was rejected at the destination N_Port."

::= { fcmPortStatsEntry 11 }

Expires June 2005

[Page 29]

Internet Draft

Fibre Channel Management MIB

December 2004

fcmPortClass2TxFbsyFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that F_BSY was generated by this port as a result of a Class 2 frame that could not be delivered because either the Fabric or the destination port was temporarily busy. Note that this counter will never increment for an N_Port."

::= { fcmPortStatsEntry 12 }

fcmPortClass2TxPbsyFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that P_BSY was generated by this port as a result of a Class 2 frame that could not be delivered because the destination port was temporarily busy. Note that this counter will never increment for an F_Port."

::= { fcmPortStatsEntry 13 }

fcmPortClass2TxFrjtFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that F_RJT was generated by this port

as a result of a Class 2 frame being rejected by the fabric.
Note that this counter will never increment for an N_Port."
 ::= { fcmPortStatsEntry 14 }

fcmPortClass2TxPrjtFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that P_RJT was generated by this port
as a result of a Class 2 frame being rejected at the
destination N_Port. Note that this counter will never
increment for an F_Port."

::= { fcmPortStatsEntry 15 }

fcmPortClass3RxFrames OBJECT-TYPE

Expires June 2005

[Page 30]

Internet Draft

Fibre Channel Management MIB

December 2004

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Class 3 frames received at this port."

::= { fcmPortStatsEntry 16 }

fcmPortClass3RxOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of octets contained in Class 3 frames received
at this port."

::= { fcmPortStatsEntry 17 }

fcmPortClass3TxFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Class 3 frames transmitted out of this port."

::= { fcmPortStatsEntry 18 }

fcmPortClass3TxOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of octets contained in Class 3 frames
transmitted out of this port."

::= { fcmPortStatsEntry 19 }

fcmPortClass3Discards OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Class 3 frames that were discarded upon
reception at this port."

::= { fcmPortStatsEntry 20 }

fcmPortClassFRxFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

Expires June 2005

[Page 31]

Internet Draft

Fibre Channel Management MIB

December 2004

STATUS current

DESCRIPTION

"The number of Class F frames received at this port."

::= { fcmPortStatsEntry 21 }

fcmPortClassFRxOctets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of octets contained in Class F frames received
at this port."

::= { fcmPortStatsEntry 22 }

fcmPortClassFTxFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

```
STATUS      current
DESCRIPTION
    "The number of Class F frames transmitted out of this port."
 ::= { fcmPortStatsEntry 23 }
```

```
fcmPortClassFTxOctets OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of octets contained in Class F frames
         transmitted out of this port."
    ::= { fcmPortStatsEntry 24 }
```

```
fcmPortClassFDiscards OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of Class F frames that were discarded upon
         reception at this port."
    ::= { fcmPortStatsEntry 25 }
```

```
--*****
-- Port Low-capacity Statistics
--
-- these are Counter32 "low-capacity" counters for systems
```

```
-- which do not support Counter64's
```

```
fcmPortLcStatsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcmPortLcStatsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A list of Counter32-based statistics for systems which do
         not support Counter64."
    ::= { fcmgmtObjects 5 }
```

fcmPortLcStatsEntry OBJECT-TYPE

SYNTAX FcmPortLcStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing low-capacity (i.e., based on Counter32) statistics for a Fibre Channel port. If any counter in this table suffers a discontinuity, the value of ifCounterDiscontinuityTime (defined in the IF-MIB) must be updated."

REFERENCE "The Interfaces Group MIB, [RFC 2863](#), June 2000."

AUGMENTS { fcmPortEntry }

::= { fcmPortLcStatsTable 1 }

FcmPortLcStatsEntry ::=

SEQUENCE {

fcmPortLcBBCreditZeros	Counter32,
fcmPortLcFullInputBuffers	Counter32,
fcmPortLcClass2RxFrames	Counter32,
fcmPortLcClass2RxOctets	Counter32,
fcmPortLcClass2TxFrames	Counter32,
fcmPortLcClass2TxOctets	Counter32,
fcmPortLcClass2Discards	Counter32,
fcmPortLcClass2RxFbsyFrames	Counter32,
fcmPortLcClass2RxPbsyFrames	Counter32,
fcmPortLcClass2RxFrjtFrames	Counter32,
fcmPortLcClass2RxPrjtFrames	Counter32,
fcmPortLcClass2TxFbsyFrames	Counter32,
fcmPortLcClass2TxPbsyFrames	Counter32,
fcmPortLcClass2TxFrjtFrames	Counter32,
fcmPortLcClass2TxPrjtFrames	Counter32,
fcmPortLcClass3RxFrames	Counter32,
fcmPortLcClass3RxOctets	Counter32,
fcmPortLcClass3TxFrames	Counter32,

Expires June 2005

[Page 33]

Internet Draft

Fibre Channel Management MIB

December 2004

fcmPortLcClass3TxOctets	Counter32,
fcmPortLcClass3Discards	Counter32
}	

fcmPortLcBBCreditZeros OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of transitions in/out of the buffer-to-buffer
 credit zero state. The other side is not providing any
 credit."
 ::= { fcmPortLcStatsEntry 1 }

fcmPortLcFullInputBuffers OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of occurrences when all input buffers of a port
 were full and outbound buffer-to-buffer credit transitioned
 to zero, i.e., there became no credit to provide to other
 side."
 ::= { fcmPortLcStatsEntry 2 }

fcmPortLcClass2RxFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Class 2 frames received at this port."
 ::= { fcmPortLcStatsEntry 3 }

fcmPortLcClass2RxOctets OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of octets contained in Class 2 frames received
 at this port."
 ::= { fcmPortLcStatsEntry 4 }

fcmPortLcClass2TxFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only

STATUS current
DESCRIPTION
 "The number of Class 2 frames transmitted out of this port."
::= { fcmPortLcStatsEntry 5 }

fcmPortLcClass2TxOctets OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of octets contained in Class 2 frames
 transmitted out of this port."
::= { fcmPortLcStatsEntry 6 }

fcmPortLcClass2Discards OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Class 2 frames that were discarded upon
 reception at this port."
::= { fcmPortLcStatsEntry 7 }

fcmPortLcClass2RxFbsyFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of times that F_BSY was returned to this port as
 a result of a Class 2 frame that could not be delivered to
 the other end of the link. This can occur when either the
 fabric or the destination port is temporarily busy. Note
 that this counter will never increment for an F_Port."
::= { fcmPortLcStatsEntry 8 }

fcmPortLcClass2RxBsyFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of times that P_BSY was returned to this port as
 a result of a Class 2 frame that could not be delivered to
 the other end of the link. This can occur when the
 destination port is temporarily busy."
::= { fcmPortLcStatsEntry 9 }

Internet Draft

Fibre Channel Management MIB

December 2004

fcmPortLcClass2RxFrjtFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that F_RJT was returned to this port as a result of a Class 2 frame that was rejected by the fabric.

Note that this counter will never increment for an F_Port."

::= { fcmPortLcStatsEntry 10 }

fcmPortLcClass2RxPrjtFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that P_RJT was returned to this port as a result of a Class 2 frame that was rejected at the

destination N_Port."

::= { fcmPortLcStatsEntry 11 }

fcmPortLcClass2TxFbsyFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that F_BSY was generated by this port as a result of a Class 2 frame that could not be delivered because either the Fabric or the destination port was

temporarily busy. Note that this counter will never increment for an N_Port."

::= { fcmPortLcStatsEntry 12 }

fcmPortLcClass2TxPbsyFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times that P_BSY was generated by this port as a result of a Class 2 frame that could not be delivered because the destination port was temporarily busy. Note

that this counter will never increment for an F_Port."

::= { fcmPortLcStatsEntry 13 }

fcmPortLcClass2TxFrjtFrames OBJECT-TYPE
SYNTAX Counter32

Expires June 2005

[Page 36]

Internet Draft

Fibre Channel Management MIB

December 2004

MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of times that F_RJT was generated by this port
 as a result of a Class 2 frame being rejected by the fabric.
 Note that this counter will never increment for an N_Port."
 ::= { fcmPortLcStatsEntry 14 }

fcmPortLcClass2TxPrjtFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of times that P_RJT was generated by this port
 as a result of a Class 2 frame being rejected at the
 destination N_Port. Note that this counter will never
 increment for an F_Port."
 ::= { fcmPortLcStatsEntry 15 }

fcmPortLcClass3RxFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Class 3 frames received at this port."
 ::= { fcmPortLcStatsEntry 16 }

fcmPortLcClass3RxOctets OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of octets contained in Class 3 frames received
 at this port."
 ::= { fcmPortLcStatsEntry 17 }

fcmPortLcClass3TxFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Class 3 frames transmitted out of this port."
 ::= { fcmPortLcStatsEntry 18 }

fcmPortLcClass3TxOctets OBJECT-TYPE

Expires June 2005

[Page 37]

Internet Draft

Fibre Channel Management MIB

December 2004

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of octets contained in Class 3 frames
 transmitted out of this port."
 ::= { fcmPortLcStatsEntry 19 }

fcmPortLcClass3Discards OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Class 3 frames that were discarded upon
 reception at this port."
 ::= { fcmPortLcStatsEntry 20 }

--*****
-- Port Error Counters
--

fcmPortErrorsTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcmPortErrorsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "Error counters for Fibre Channel ports."
 ::= { fcmgmtObjects 6 }

fcmPortErrorsEntry OBJECT-TYPE

```

SYNTAX      FcmPortErrorsEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Error counters for a Fibre Channel port.  If any counter in
    this table suffers a discontinuity, the value of
    ifCounterDiscontinuityTime (defined in the IF-MIB) must be
    updated."
REFERENCE   "The Interfaces Group MIB, RFC 2863, June 2000."
AUGMENTS    { fcmPortEntry }
::= { fcmPortErrorsTable 1 }

```

```

FcmPortErrorsEntry ::=
    SEQUENCE {

```

Expires June 2005

[Page 38]

Internet Draft

Fibre Channel Management MIB

December 2004

```

    fcmPortRxLinkResets          Counter32,
    fcmPortTxLinkResets          Counter32,
    fcmPortLinkResets            Counter32,
    fcmPortRxOfflineSequences    Counter32,
    fcmPortTxOfflineSequences    Counter32,
    fcmPortLinkFailures          Counter32,
    fcmPortLossofSynchs          Counter32,
    fcmPortLossofSignals         Counter32,
    fcmPortPrimSeqProtocolErrors Counter32,
    fcmPortInvalidTxWords        Counter32,
    fcmPortInvalidCRCs           Counter32,
    fcmPortInvalidOrderedSets    Counter32,
    fcmPortFrameTooLongs         Counter32,
    fcmPortTruncatedFrames       Counter32,
    fcmPortAddressErrors         Counter32,
    fcmPortDelimiterErrors       Counter32,
    fcmPortEncodingDisparityErrors Counter32,
    fcmPortOtherErrors           Counter32
}

```

fcmPortRxLinkResets OBJECT-TYPE

```

SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The number of Link Reset (LR) Primitive Sequences
 received."
 ::= { fcmPortErrorsEntry 1 }

fcmPortTxLinkResets OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Link Reset (LR) Primitive Sequences
 transmitted."
 ::= { fcmPortErrorsEntry 2 }

fcmPortLinkResets OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of times the reset link protocol was initiated
 on this port. This includes the number of Loop

Expires June 2005

[Page 39]

Internet Draft

Fibre Channel Management MIB

December 2004

 Initialization Primitive (LIP) events on an arbitrated loop
 port."
 ::= { fcmPortErrorsEntry 3 }

fcmPortRxOfflineSequences OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Offline (OLS) Primitive Sequences received at
 this port."
 ::= { fcmPortErrorsEntry 4 }

fcmPortTxOfflineSequences OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of Offline (OLS) Primitive Sequences transmitted

by this port."
 ::= { fcmPortErrorsEntry 5 }

fcmPortLinkFailures OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of link failures. This count is part of FC-PH's Link Error Status Block (LESB)."

REFERENCE

"FC-PH, rev 4.3, 1 June 1994, [section 29.8](#)."

::= { fcmPortErrorsEntry 6 }

fcmPortLossofSynchs OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of instances of synchronization loss detected at this port. This count is part of FC-PH's Link Error Status Block (LESB)."

REFERENCE

"FC-PH, rev 4.3, 1 June 1994, [section 29.8](#)."

::= { fcmPortErrorsEntry 7 }

Expires June 2005

[Page 40]

Internet Draft

Fibre Channel Management MIB

December 2004

fcmPortLossofSignals OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of instances of signal loss detected at this port. This count is part of FC-PH's Link Error Status Block (LESB)."

REFERENCE

"FC-PH, rev 4.3, 1 June 1994, [section 29.8](#)."

::= { fcmPortErrorsEntry 8 }

fcmPortPrimSeqProtocolErrors OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The number of primitive sequence protocol errors detected
 at this port. This count is part of FC-PH's Link Error
 Status Block (LESB)."
 REFERENCE
 "FC-PH, rev 4.3, 1 June 1994, [section 29.8](#)."
 ::= { fcmPortErrorsEntry 9 }

fcmPortInvalidTxWords OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The number of invalid transmission words received at this
 port. This count is part of FC-PH's Link Error Status Block
 (LESB)."
 REFERENCE
 "FC-PH, rev 4.3, 1 June 1994, [section 29.8](#)."
 ::= { fcmPortErrorsEntry 10 }

fcmPortInvalidCRCs OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The number of frames received with invalid CRC. This count
 is part of FC-PH's Link Error Status Block (LESB)."
 REFERENCE
 "FC-PH, rev 4.3, 1 June 1994, [section 29.8](#)."

Expires June 2005

[Page 41]

Internet Draft

Fibre Channel Management MIB

December 2004

::= { fcmPortErrorsEntry 11 }

fcmPortInvalidOrderedSets OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The number of invalid ordered sets received at this port."
 ::= { fcmPortErrorsEntry 12 }

fcmPortFrameTooLongs OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of frames received at this port where the frame length was greater than what was agreed to in FLOGI/PLOGI. This could be caused by losing the end of frame delimiter."

::= { fcmPortErrorsEntry 13 }

fcmPortTruncatedFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of frames received at this port where the frame length was less than the minimum indicated by the frame header - normally 24 bytes, but it could be more if the DFCTL field indicates an optional header should have been present."

::= { fcmPortErrorsEntry 14 }

fcmPortAddressErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of frames received with unknown addressing; for example, an unknown SID or DID."

::= { fcmPortErrorsEntry 15 }

fcmPortDelimiterErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

"The number of invalid frame delimiters received at this port. An example is a frame with a class 2 start and a class 3 at the end."

::= { fcmPortErrorsEntry 16 }

fcmPortEncodingDisparityErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of encoding disparity errors received at this port."

::= { fcmPortErrorsEntry 17 }

fcmPortOtherErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of errors which were detected on this port but which were not counted by any other error counter in this row."

::= { fcmPortErrorsEntry 18 }

--*****

-- The Fibre Channel Fx_Port Table

--

fcmFxPortTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcmFxPortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Additional information about Fibre Channel ports which is specific to Fx_Ports. This table will contain one entry for each fcmPortTable entry which represents an Fx_Port."

::= { fcmgmtObjects 7 }

fcmFxPortEntry OBJECT-TYPE

SYNTAX FcmFxPortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry contains information about a specific Fx_Port."

INDEX { ifIndex }

::= { fcmFxPortTable 1 }

FcmFxPortEntry ::=

SEQUENCE {

fcmFxPortRatov	Unsigned32,
fcmFxPortEdtov	Unsigned32,
fcmFxPortRttov	Unsigned32,
fcmFxPortHoldTime	Unsigned32,
fcmFxPortCapBbCreditMax	FcBbCredit,
fcmFxPortCapBbCreditMin	FcBbCredit,
fcmFxPortCapDataFieldSizeMax	FcDataFieldSize,
fcmFxPortCapDataFieldSizeMin	FcDataFieldSize,
fcmFxPortCapClass2SeqDeliv	TruthValue,
fcmFxPortCapClass3SeqDeliv	TruthValue,
fcmFxPortCapHoldTimeMax	Unsigned32,
fcmFxPortCapHoldTimeMin	Unsigned32

}

fcmFxPortRatov OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

Internet Draft

Fibre Channel Management MIB

December 2004

"The Resource_Allocation_Timeout Value configured for this Fx_Port. This is used as the timeout value for determining when to reuse an Nx_Port resource such as a Recovery_Qualifier. It represents the Error_Detect_Timeout value (see fcmFxPortEdtov) plus twice the maximum time that a frame may be delayed within the Fabric and still be delivered."

::= { fcmFxPortEntry 1 }

fcmFxPortEdtov OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Error_Detect_Timeout value configured for this Fx_Port. This is used as the timeout value for detecting an error condition."

::= { fcmFxPortEntry 2 }

fcmFxPortRttov OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Receiver_Transmitter_Timeout value of this Fx_Port. This is used by the receiver logic to detect Loss of Synchronization."

::= { fcmFxPortEntry 3 }

fcmFxPortHoldTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "microseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum time that this Fx_Port shall hold a frame before discarding the frame if it is unable to deliver the frame. The value 0 means that this Fx_Port does not support this parameter."

::= { fcmFxPortEntry 4 }

fcmFxPortCapBbCreditMax OBJECT-TYPE
SYNTAX FcBbCredit

Expires June 2005

[Page 45]

Internet Draft

Fibre Channel Management MIB

December 2004

UNITS "buffers"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The maximum number of receive buffers which this port is
capable of making available for holding frames from attached
Nx_Port(s)."
::= { fcmFxPortEntry 5 }

fcmFxPortCapBbCreditMin OBJECT-TYPE

SYNTAX FcBbCredit
UNITS "buffers"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The minimum number of receive buffers which this port is
capable of making available for holding frames from attached
Nx_Port(s)."
::= { fcmFxPortEntry 6 }

fcmFxPortCapDataFieldSizeMax OBJECT-TYPE

SYNTAX FcDataFieldSize
UNITS "bytes"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The maximum size in bytes of the Data Field in a frame that
this Fx_Port is capable of receiving from an attached
Nx_Port."
::= { fcmFxPortEntry 7 }

fcmFxPortCapDataFieldSizeMin OBJECT-TYPE

SYNTAX FcDataFieldSize
UNITS "bytes"
MAX-ACCESS read-only

STATUS current
DESCRIPTION
 "The minimum size in bytes of the Data Field in a frame that
 this Fx_Port is capable of receiving from an attached
 Nx_Port."
::= { fcmFxPortEntry 8 }

fcmFxPortCapClass2SeqDeliv OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only

Expires June 2005

[Page 46]

Internet Draft

Fibre Channel Management MIB

December 2004

STATUS current
DESCRIPTION
 "An indication of whether this Fx_Port is capable of
 supporting Class 2 Sequential Delivery."
::= { fcmFxPortEntry 9 }

fcmFxPortCapClass3SeqDeliv OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "An indication of whether this Fx_Port is capable of
 supporting Class 3 Sequential Delivery."
::= { fcmFxPortEntry 10 }

fcmFxPortCapHoldTimeMax OBJECT-TYPE
SYNTAX Unsigned32
UNITS "microseconds"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The maximum holding time that this Fx_Port is capable of
 supporting."
::= { fcmFxPortEntry 11 }

fcmFxPortCapHoldTimeMin OBJECT-TYPE
SYNTAX Unsigned32
UNITS "microseconds"
MAX-ACCESS read-only

STATUS current
DESCRIPTION
 "The minimum holding time that this Fx_Port is capable of
 supporting."
 ::= { fcmFxPortEntry 12 }

Expires June 2005

[Page 47]

Internet Draft

Fibre Channel Management MIB

December 2004

--*****

-- The Fibre Channel Inter-Switch Port Table

--

fcmISPortTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcmISPortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

 "Additional information about E_Ports, B_Ports, and any
 other type of Fibre Channel port to which inter-switch links
 can be connected. This table will contain one entry for
 each fcmPortTable entry which represents such a port."

::= { fcmgmtObjects 8 }

fcmISPortEntry OBJECT-TYPE

SYNTAX FcmISPortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

 "Each entry contains information about a specific port
 connected to an inter-switch link."

INDEX { ifIndex }

```

 ::= { fcmISPortTable 1 }

FcmISPortEntry ::=
    SEQUENCE {
        fcmISPortClassFCredit          FcBbCredit,
        fcmISPortClassFDataFieldSize   FcDataFieldSize
    }

fcmISPortClassFCredit OBJECT-TYPE
    SYNTAX      FcBbCredit
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "The maximum number of Class F data frames which can be
        transmitted by the inter-switch port without receipt of ACK
        or Link_Response frames."
    ::= { fcmISPortEntry 1 }

fcmISPortClassFDataFieldSize OBJECT-TYPE
    SYNTAX      FcDataFieldSize
    UNITS        "bytes"
    MAX-ACCESS   read-only

```

Expires June 2005

[Page 48]

Internet Draft

Fibre Channel Management MIB

December 2004

```

    STATUS       current
    DESCRIPTION
        "The Receive Data Field Size which the inter-switch port has
        agreed to support for Class F frames to/from this port. The
        size specifies the largest Data Field Size for an FT_1
        frame."
    ::= { fcmISPortEntry 2 }

--*****
-- The Fabric Login table
--
-- This table contains the information held by FC switches
-- about the Nx_Ports which are logged-in/attached to their
-- Fx_Ports

fcmFLoginTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FcmFLoginEntry

```

MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"A table that contains one entry for each Nx_Port logged-in/attached to a particular Fx_Port in the switch. Each entry contains the services parameters established during the most recent Fabric Login, explicit or implicit. Note that an Fx_Port may have one or more Nx_Ports attached to it."

::= { fcmgmtObjects 9 }

fcmFLoginEntry OBJECT-TYPE

SYNTAX FcmFLoginEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"An entry containing service parameters established from a successful Fabric Login."

INDEX { ifIndex, fcmFLoginNxPortIndex }

::= { fcmFLoginTable 1 }

FcmFLoginEntry ::=

SEQUENCE {
 fcmFLoginNxPortIndex Unsigned32,
 fcmFLoginPortWwn FcNameIdOrZero,
 fcmFLoginNodeWwn FcNameIdOrZero,
 fcmFLoginBbCreditModel FcBbCreditModel,
 fcmFLoginBbCredit FcBbCredit,

 fcmFLoginClassesAgreed FcClasses,
 fcmFLoginClass2SeqDelivAgreed TruthValue,
 fcmFLoginClass2DataFieldSize FcDataFieldSize,
 fcmFLoginClass3SeqDelivAgreed TruthValue,
 fcmFLoginClass3DataFieldSize FcDataFieldSize
}

fcmFLoginNxPortIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"An arbitrary integer which uniquely identifies an Nx_Port amongst all those attached to the Fx_Port indicated by ifIndex.

After a value of this object is assigned to a particular Nx_Port, that value can be re-used when and only when it is assigned to the same Nx_Port, or, after a reset of the value of the relevant instance of ifCounterDiscontinuityTime."

REFERENCE "The Interfaces Group MIB, [RFC 2863](#), June 2000."

::= { fcmFLoginEntry 1 }

fcmFLoginPortWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The port name of the attached Nx_Port, or the zero-length string if unknown."

::= { fcmFLoginEntry 2 }

fcmFLoginNodeWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The node name of the attached Nx_Port, or the zero-length string if unknown."

::= { fcmFLoginEntry 3 }

fcmFLoginBbCreditModel OBJECT-TYPE

SYNTAX FcBbCreditModel

MAX-ACCESS read-only

STATUS current

Expires June 2005

[Page 50]

Internet Draft

Fibre Channel Management MIB

December 2004

DESCRIPTION

"The buffer-to-buffer credit model in use by the Fx_Port."

::= { fcmFLoginEntry 4 }

fcmFLoginBbCredit OBJECT-TYPE

SYNTAX FcBbCredit
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The number of buffers available for holding frames to be
 transmitted to the attached Nx_Port. These buffers are for
 buffer-to-buffer flow control in the direction from Fx_Port
 to Nx_Port."
 ::= { fcmFLoginEntry 5 }

fcmFLoginClassesAgreed OBJECT-TYPE

SYNTAX FcClasses
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The Classes of Service which the Fx_Port has agreed to
 support for this Nx_Port."
 ::= { fcmFLoginEntry 6 }

fcmFLoginClass2SeqDelivAgreed OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "An indication of whether the Fx_Port has agreed to support
 Class 2 sequential delivery for this Nx_Port. This is only
 meaningful if Class 2 service has been agreed."
 ::= { fcmFLoginEntry 7 }

fcmFLoginClass2DataFieldSize OBJECT-TYPE

SYNTAX FcDataFieldSize
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The Receive Data Field Size which the Fx_Port has agreed to
 support for Class 2 frames to/from this Nx_Port. The size
 specifies the largest Data Field Size for an FT_1 frame.
 This is only meaningful if Class 2 service has been agreed."
 ::= { fcmFLoginEntry 8 }

fcmFLoginClass3SeqDelivAgreed OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An indication of whether the Fx_Port has agreed to support Class 3 sequential delivery for this Nx_Port. This is only meaningful if Class 3 service has been agreed."

::= { fcmFLoginEntry 9 }

fcmFLoginClass3DataFieldSize OBJECT-TYPE

SYNTAX FcDataFieldSize

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Receive Data Field Size which the Fx_Port has agreed to support for Class 3 frames to/from this Nx_Port. The size specifies the largest Data Field Size for an FT_1 frame.

This is only meaningful if Class 3 service has been agreed."

::= { fcmFLoginEntry 10 }

--*****

-- The Link table

--

-- This table is intended to assist management applications

-- in determining the topology of the network. The table

-- contains any recent information which the agent knows

-- about Fibre Channel links, both those which terminate at

-- a local port, as well as any others for which information

-- is known.

fcmLinkTable OBJECT-TYPE

SYNTAX SEQUENCE OF FcmLinkEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table containing any Fibre Channel link information which is known to local Fibre Channel managed instances. One end of such a link is typically at a local port, but the table can also contain information on links for which neither end is a local port.

If one end of a link terminates locally, then that end is termed 'end1'; the other end is termed 'end2'."

Internet Draft

Fibre Channel Management MIB

December 2004

```
::= { fcmgmtObjects 10 }
```

```
fcmLinkEntry OBJECT-TYPE
```

```
SYNTAX      FcmLinkEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

```
    "An entry containing information which a particular Fibre
    Channel managed instance has about a Fibre Channel link.
```

```
    The two ends of the link are called 'end1' and 'end2'."
```

```
INDEX { fcmInstanceIndex, fcmLinkIndex }
 ::= { fcmLinkTable 1 }
```

```
FcmLinkEntry ::=
```

```
SEQUENCE {
    fcmLinkIndex                Unsigned32,
    fcmLinkEnd1NodeWwn          FcNameIdOrZero,
    fcmLinkEnd1PhysPortNumber   Unsigned32,
    fcmLinkEnd1PortWwn          FcNameIdOrZero,
    fcmLinkEnd2NodeWwn          FcNameIdOrZero,
    fcmLinkEnd2PhysPortNumber   Unsigned32,
    fcmLinkEnd2PortWwn          FcNameIdOrZero,
    fcmLinkEnd2AgentAddress     SnmpAdminString,
    fcmLinkEnd2PortType         FcPortType,
    fcmLinkEnd2UnitType         FcUnitFunctions,
    fcmLinkEnd2FcAddressId      FcAddressIdOrZero
}
```

```
fcmLinkIndex OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

```
    "An arbitrary integer which uniquely identifies one link
    within the set of links about which a particular managed
    instance has information."
```

```
 ::= { fcmLinkEntry 1 }
```

```
fcmLinkEnd1NodeWwn OBJECT-TYPE
```

```
SYNTAX      FcNameIdOrZero
MAX-ACCESS  read-only
STATUS      current
```

DESCRIPTION

"The node name of end1, or the zero-length string if

Expires June 2005

[Page 53]

Internet Draft

Fibre Channel Management MIB

December 2004

unknown."
 ::= { fcmLinkEntry 2 }

fcmLinkEnd1PhysPortNumber OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The physical port number of end1, or zero if unknown."

REFERENCE

"FC-GS-3, [section 6.1.2.2.5](#)"
 ::= { fcmLinkEntry 3 }

fcmLinkEnd1PortWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The port WWN of end1, or the zero-length string if unknown.
('end1' is local if this value is equal to the value of
fcmPortWwn in one of the rows of the fcmPortTable.)"

::= { fcmLinkEntry 4 }

fcmLinkEnd2NodeWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The node name of end2, or the zero-length string if
unknown."

::= { fcmLinkEntry 5 }

fcmLinkEnd2PhysPortNumber OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The physical port number of end2, or zero if unknown."
REFERENCE
 "FC-GS-3, [section 6.1.2.2.5](#)"
::= { fcmLinkEntry 6 }

fcmLinkEnd2PortWwn OBJECT-TYPE
 SYNTAX FcNameIdOrZero
 MAX-ACCESS read-only

Expires June 2005

[Page 54]

Internet Draft

Fibre Channel Management MIB

December 2004

 STATUS current
 DESCRIPTION
 "The port WWN of end2, or the zero-length string if
 unknown."
 ::= { fcmLinkEntry 7 }

fcmLinkEnd2AgentAddress OBJECT-TYPE
 SYNTAX SnmpAdminString
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The address of the management agent for the Fibre Channel
 Interconnect Element or Platform of which end2 is a part.
 The GS-4 specification provides some information about
 management agents. If the address is unknown, the value of
 this object is the zero-length string."
 REFERENCE
 "FC-GS-3, [section 6.1.2.1.7](#)"
 ::= { fcmLinkEntry 8 }

fcmLinkEnd2PortType OBJECT-TYPE
 SYNTAX FcPortType
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The port type of end2."
 REFERENCE
 "FC-GS-3, [section 6.1.2.2.2](#)"
 ::= { fcmLinkEntry 9 }

fcmLinkEnd2UnitType OBJECT-TYPE

SYNTAX FcUnitFunctions

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of/function(s) performed by the Fibre Channel
Interconnect Element or Platform of which end2 is a part."

REFERENCE

"FC-GS-3, sections [6.1.2.1.2](#) and [6.1.2.3.2](#)"

::= { fcmLinkEntry 10 }

fcmLinkEnd2FcAddressId OBJECT-TYPE

SYNTAX FcAddressIdOrZero

MAX-ACCESS read-only

STATUS current

Expires June 2005

[Page 55]

Internet Draft

Fibre Channel Management MIB

December 2004

DESCRIPTION

"The Fibre Channel Address ID of end2, or the zero-length
string if unknown."

::= { fcmLinkEntry 11 }

```
--*****
```

```
-- Conformance Section
```

```
--
```

```
fcmgmtCompliances OBJECT IDENTIFIER ::= { fcmgmtConformance 1 }
```

```
fcmgmtGroups      OBJECT IDENTIFIER ::= { fcmgmtConformance 2 }
```

```
fcmgmtCompliance MODULE-COMPLIANCE
```

```
    STATUS current
```

```
    DESCRIPTION
```

```
        "Describes the requirements for compliance to this Fibre  
        Channel Management MIB."
```

```
    MODULE -- this module
```

```
        MANDATORY-GROUPS { fcmInstanceBasicGroup,  
                            fcmPortBasicGroup,  
                            fcmPortErrorsGroup }
```

```
        GROUP fcmPortStatsGroup
```

```
    DESCRIPTION
```

"This group is mandatory for all systems which are able to support the Counter64 data type."

GROUP fcmPortClass23StatsGroup

DESCRIPTION

"This group is mandatory only for systems which keep class-specific traffic statistics on Class 2 on Class 3 traffic and are able to support the Counter64 data type."

GROUP fcmPortClassFStatsGroup

DESCRIPTION

"This group is mandatory only for FC switches which keep statistics on Class F traffic."

GROUP fcmPortLcStatsGroup

DESCRIPTION

"This group is mandatory only for agents which can not support the Counter64 data type and/or need to provide information accessible by SNMPv1 applications."

GROUP fcmSwitchBasicGroup

DESCRIPTION

"This group is mandatory only for Fibre Channel managed instances which manage Fibre Channel switches."

Expires June 2005

[Page 57]

Internet Draft

Fibre Channel Management MIB

December 2004

GROUP fcmSwitchPortGroup

DESCRIPTION

"This group is mandatory only for Fibre Channel managed instances which manage Fibre Channel switches."

GROUP fcmSwitchLoginGroup

DESCRIPTION

"This group is mandatory only for Fibre Channel managed instances which manage Fibre Channel switches."

GROUP fcmLinkBasicGroup

DESCRIPTION

"This group is optional."

OBJECT fcmInstancePhysicalIndex

SYNTAX Integer32 (0)

DESCRIPTION

"Implementation of a non-zero value is not required."

OBJECT fcmInstanceSoftwareIndex

SYNTAX Integer32 (0)

DESCRIPTION

"Implementation of a non-zero value is not required."

OBJECT fcmInstanceTextName

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT fcmInstanceDescr

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT fcmPortAdminType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT fcmPortAdminSpeed

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

Expires June 2005

[Page 58]

Internet Draft

Fibre Channel Management MIB

December 2004

OBJECT fcmSwitchDomainId

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT fcmISPortClassFCredit

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

::= { fcmgmtCompliances 1 }

--*****
-- Object Groups
--

fcmInstanceBasicGroup OBJECT-GROUP

OBJECTS { fcmInstanceWwn, fcmInstanceFunctions,
fcmInstancePhysicalIndex, fcmInstanceSoftwareIndex,
fcmInstanceStatus, fcmInstanceTextName,
fcmInstanceDescr, fcmInstanceFabricId }

STATUS current

DESCRIPTION

"Basic information about Fibre Channel managed instances."

::= { fcmgmtGroups 1 }

fcmSwitchBasicGroup OBJECT-GROUP

OBJECTS { fcmSwitchDomainId, fcmSwitchPrincipal, fcmSwitchWWN }

STATUS current

DESCRIPTION

"Basic information about Fibre Channel switches."

::= { fcmgmtGroups 2 }

fcmPortBasicGroup OBJECT-GROUP

OBJECTS { fcmPortInstanceIndex, fcmPortWwn, fcmPortNodeWwn,
fcmPortAdminType, fcmPortOperType, fcmPortFcCapClass,
fcmPortFcOperClass, fcmPortTransmitterType,
fcmPortConnectorType, fcmPortSerialNumber,
fcmPortPhysicalNumber, fcmPortAdminSpeed,
fcmPortCapProtocols, fcmPortOperProtocols }

STATUS current

DESCRIPTION

"Basic information about Fibre Channel ports."

::= { fcmgmtGroups 3 }

```

fcmPortStatsGroup OBJECT-GROUP
    OBJECTS { fcmPortBBCreditZeros, fcmPortFullInputBuffers }
    STATUS current
    DESCRIPTION
        "Traffic statistics, which are not specific to any one class
        of service, for Fibre Channel ports."
    ::= { fcmgmtGroups 4 }

fcmPortClass23StatsGroup OBJECT-GROUP
    OBJECTS { fcmPortClass2RxFrames, fcmPortClass2RxOctets,
        fcmPortClass2TxFrames, fcmPortClass2TxOctets,
        fcmPortClass2Discards, fcmPortClass2RxFbsyFrames,
        fcmPortClass2RxPbsyFrames,
        fcmPortClass2RxFrjtFrames,
        fcmPortClass2RxPrjtFrames,
        fcmPortClass2TxFbsyFrames,
        fcmPortClass2TxPbsyFrames,
        fcmPortClass2TxFrjtFrames,
        fcmPortClass2TxPrjtFrames, fcmPortClass3RxFrames,
        fcmPortClass3RxOctets, fcmPortClass3TxFrames,
        fcmPortClass3TxOctets, fcmPortClass3Discards }
    STATUS current
    DESCRIPTION
        "Traffic statistics for Class 2 and Class 3 traffic on Fibre
        Channel ports."
    ::= { fcmgmtGroups 5 }

fcmPortClassFStatsGroup OBJECT-GROUP
    OBJECTS { fcmPortClassFRxFrames,
        fcmPortClassFRxOctets,
        fcmPortClassFTxFrames,
        fcmPortClassFTxOctets,
        fcmPortClassFDiscards }
    STATUS current
    DESCRIPTION
        "Traffic statistics for Class F traffic on Fibre Channel
        ports."
    ::= { fcmgmtGroups 6 }

fcmPortLcStatsGroup OBJECT-GROUP
    OBJECTS { fcmPortLcBBCreditZeros, fcmPortLcFullInputBuffers,
        fcmPortLcClass2RxFrames, fcmPortLcClass2RxOctets,
        fcmPortLcClass2TxFrames, fcmPortLcClass2TxOctets,

```

```
    fcmPortLcClass2Discards, fcmPortLcClass3Discards,
    fcmPortLcClass3RxFrames, fcmPortLcClass3RxOoctets,
    fcmPortLcClass3TxFrames, fcmPortLcClass3TxOoctets,
    fcmPortLcClass2RxFbsyFrames,
    fcmPortLcClass2RxPbsyFrames,
    fcmPortLcClass2RxFrjtFrames,
    fcmPortLcClass2RxPrjtFrames,
    fcmPortLcClass2TxFbsyFrames,
    fcmPortLcClass2TxPbsyFrames,
    fcmPortLcClass2TxFrjtFrames,
    fcmPortLcClass2TxPrjtFrames }
```

STATUS current

DESCRIPTION

"Low-capacity (32-bit) statistics for Fibre Channel ports."

::= { fcmgmtGroups 7 }

fcmPortErrorsGroup OBJECT-GROUP

```
    OBJECTS { fcmPortRxLinkResets, fcmPortTxLinkResets,
    fcmPortLinkResets, fcmPortRxOfflineSequences,
    fcmPortTxOfflineSequences, fcmPortLinkFailures,
    fcmPortLossofSynchs, fcmPortLossofSignals,
    fcmPortPrimSeqProtocolErrors, fcmPortInvalidTxWords,
    fcmPortInvalidCRCs, fcmPortInvalidOrderedSets,
    fcmPortFrameTooLongs, fcmPortTruncatedFrames,
    fcmPortAddressErrors, fcmPortDelimiterErrors,
    fcmPortEncodingDisparityErrors,
    fcmPortOtherErrors }
```

STATUS current

DESCRIPTION

"Error statistics for Fibre Channel ports."

::= { fcmgmtGroups 8 }

fcmSwitchPortGroup OBJECT-GROUP

```
    OBJECTS { fcmFxpPortRatov, fcmFxpPortEdtov, fcmFxpPortRttov,
    fcmFxpPortHoldTime, fcmFxpPortCapBbCreditMax,
    fcmFxpPortCapBbCreditMin,
    fcmFxpPortCapDataFieldSizeMax,
    fcmFxpPortCapDataFieldSizeMin,
    fcmFxpPortCapClass2SeqDeliv,
    fcmFxpPortCapClass3SeqDeliv,
    fcmFxpPortCapHoldTimeMax,
    fcmFxpPortCapHoldTimeMin,
    fcmISPortClassFCredit,
    fcmISPortClassFDDataFieldSize }
```

STATUS current

Internet Draft

Fibre Channel Management MIB

December 2004

DESCRIPTION

"Information about ports on a Fibre Channel switch."

::= { fcmgmtGroups 9 }

fcmSwitchLoginGroup OBJECT-GROUP

OBJECTS { fcmFLoginPortWwn, fcmFLoginNodeWwn,
fcmFLoginBbCreditModel, fcmFLoginBbCredit,
fcmFLoginClassesAgreed,
fcmFLoginClass2SeqDelivAgreed,
fcmFLoginClass2DataFieldSize,
fcmFLoginClass3SeqDelivAgreed,
fcmFLoginClass3DataFieldSize }

STATUS current

DESCRIPTION

"Information known to a Fibre Channel switch about
attached/logged-in Nx_Ports."

::= { fcmgmtGroups 10 }

fcmLinkBasicGroup OBJECT-GROUP

OBJECTS { fcmLinkEnd1NodeWwn , fcmLinkEnd1PhysPortNumber,
fcmLinkEnd1PortWwn, fcmLinkEnd2NodeWwn ,
fcmLinkEnd2PhysPortNumber, fcmLinkEnd2PortWwn,
fcmLinkEnd2AgentAddress, fcmLinkEnd2PortType,
fcmLinkEnd2UnitType, fcmLinkEnd2FcAddressId }

STATUS current

DESCRIPTION

"Information about Fibre Channel links."

::= { fcmgmtGroups 11 }

END

Internet Draft

Fibre Channel Management MIB

December 2004

7. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in [BCP-11](#). Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementors or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

8. Acknowledgements

This memo is partly based on the information contained in the original submission of the Fibre Channel Management Integration MIB to the IETF's IPFC Working Group as [draft-ietf-ipfc-fcmgmt-int-mib-0n.txt](#), and partly based on [RFC 2837](#).

Feedback has been incorporated into this document based on the comments of the following: Sudhir Pendse, SimpleSoft; Steve Senum, Cisco Systems; and Kha Sin Teow, Brocade.

9. Normative References

[RFC2434]

Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP:26, [RFC 2434](#), October 1998.

[RFC2578]

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.

Expires June 2005

[Page 63]

Internet Draft

Fibre Channel Management MIB

December 2004

[RFC2579]

McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.

[RFC2580]

McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.

[RFC2737]

McCloghrie, K., and A. Bierman, "Entity MIB (Version 2)", [RFC 2737](#), December 1999.

[RFC2790]

Waldbusser, S., and P. Grillo, "Host Resources MIB", [RFC 2790](#), March 2000.

[RFC2863]

McCloghrie, K., and F. Kastenholz, "The Interfaces Group MIB", [RFC 2863](#), Cisco Systems, Argon Networks, June 2000.

[RFC3411]

Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 58, [RFC 3411](#), December 2002.

[FC-AL]

"Information Technology - Fibre Channel - Arbitrated Loop (FC-AL)",

ANSI X3.272, 1996.

[FC-AL-2]

"Fibre Channel - Arbitrated Loop (FC-AL-2)", ANSI INCITS 332-1999, 1999.

[FC-BB]

"Fibre Channel - Backbone (FC-BB)" ANSI INCITS 342-2001, 2001.

[FCP]

"SCSI-3 Fibre Channel Protocol (FCP)", ANSI X3.269, 1996.

[FC-FLA]

"Fibre Channel - Fabric Loop Attachment (FC-FLA)", ANSI INCITS TR-20-1998, 1998.

Expires June 2005

[Page 64]

Internet Draft

Fibre Channel Management MIB

December 2004

[FC-FS]

"Fibre Channel - Framing and Signaling (FC-FS)" ANSI INCITS 373-2003, April 2003.

[FC-GS-3]

"Fibre Channel - Generic Services - 3 (FC-GS-3)" ANSI INCITS 348-2001, 2001.

[FC-MI]

"Fibre Channel - Methodologies for Interconnects Technical Report (FC-MI)" INCITS TR-30-2002, 2002.

[FC-PH]

"Information Technology - Fibre Channel Physical and Signaling Interface (FC-PH)", ANSI X3.230, 1994.

[FC-SW]

"Fibre Channel - Switch Fabric (FC-SW)", ANSI INCITS 321-1998, 1998.

[FC-SW2]

"Fibre Channel - Switch Fabric - 2 (FC-SW-2)", ANSI INCITS 355-2001, June 2001.

10. Informative References

[RFC2741]

Daniele, M., Wijnen, B., Ellison, M., and D. Francisco. "Agent Extensibility (AgentX) Protocol Version 1", [RFC 2741](#), January 2000.

[RFC2837]

Teow, K., "Definitions of Managed Objects for the Fabric Element in Fibre Channel Standard", [RFC 2837](#), May 2000.

[RFC3410]

Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.

[WWN1]

Snively, R., "New identifier formats based on IEEE registration", <http://standards.ieee.org/regauth/oui/tutorials/fibreformat.html>, 16 January 2001.

Expires June 2005

[Page 65]

Internet Draft

Fibre Channel Management MIB

December 2004

[WWN2]

Snively, R., "Use of the IEEE Registration Authority assigned 'company_id' with the ANSI X3.230 FC-PH Fibre Channel specification and its extensions", http://standards.ieee.org/regauth/oui/tutorials/fibrecomp_id.html, 24 February 1997.

[SENSOR]

Bierman, A., Romascanu, D., and KC Norseth, "Entity Sensor Management Information Base", Internet Draft, working draft, 16 October 2002.

11. Security Considerations

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write:

fcmInstanceTextName
fcmInstanceDescr
fcmSwitchDomainId
fcmPidAdminType
fcmPidAdminSpeed
fcmPidPortClassFCredit

Such objects may be considered sensitive or vulnerable in some network environments. For example, the ability to change network topology or network speed may afford an attacker the ability to obtain better performance at the expense of other network users; setting fcmSwitchDomainId to an invalid value could lead to denial of service in some configurations. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. In particular, these objects provide information on network topology:

fcmlinkEnd1NodeWwn
fcmlinkEnd1PhysPortNumber
fcmlinkEnd1PortWwn

fcmlinkEnd2NodeWwn
fcmlinkEnd2PhysPortNumber
fcmlinkEnd2PortWwn
fcmlinkEnd2AgentAddress
fcmlinkEnd2PortType
fcmlinkEnd2UnitType
fcmlinkEnd2FcAddressId

SNMP versions prior to SNMPv3 did not include adequate security. 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 module.

It is RECOMMENDED that implementors consider the security features as provided by the SNMPv3 framework (see [\[RFC3410\]](#), section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

[12.](#) IANA Considerations

[12.1.](#) OID Assignment

IANA is requested to make a MIB OID assignment under the transmission branch. Specifically, for { transmission 56 } to be assigned as the OID for fcMgmtMIB. This sub-identifier is requested because this MIB contains the media-specific definitions which correspond to the ifType value of fibreChannel(56).

[12.2.](#) FC Port Type Registry

IANA is requested to establish a registry for Fibre Channel Port Types. The registry is to be split into disjoint subset ranges:

- 1) a 'standard' range for Fibre Channel Port Types which have been standardized by the InterNational Committee for Information Technology Standards (INCITS)'s Technical Committee T11 (see

- the Expert Reviewer is to be appointed by the IESG.
- the Expert Reviewer shall obtain approval (or rejection) from INCITS Technical Committee T11 via the chair of that Committee. Rejected values shall not be added to the registry.
- if the addition is approved, the Expert shall advise IANA of how to record the reference to the T11 specification document which describes the newly added port type(s), and which is considered to be the "other permanent and readily available reference" required by [[RFC2434](#)].

The initial assignments in the 'standard' range will be as follows:

Assigned Value	Type	Meaning
-----	-----	-----
1	unknown	for use when the type is not known, or is "unidentified" as specified in section 5.1.2.10 of [FC-GS-3]
2	other	used for types without assigned values
3	--	an obsolete value, not to be re-assigned
4	N_Port	see [FC-FS]
5	NL_Port	see [FC-FS]
6	F_Port	see [FC-FS]
7	FL_Port	see [FC-FS]
8	E_Port	see [FC-FS]
9	B_Port	see [FC-FS]
10	G_Port	see [FC-SW-3]
11	GL_Port	see [FC-SW-3]
12	F/NL_Port	see [FC-AL-2]

It is suggested that the above range can be extended up to a maximum of 9,999.

- 2) a range which is assigned under the "Private Use" policy described in [[RFC2434](#)] and is for values intended for private use by one party or among mutually consenting parties. It is suggested that values in this range extend from 10,000 to 99,999. IANA is instructed not to make any allocations from this range.

3) values larger than 99,999 be RESERVED.

Internet Draft

Fibre Channel Management MIB

December 2004

[13.](#) Comparison to [draft-ietf-ipfc-fcmgmt-int-mib-07.txt](#)

[13.1.](#) Problems with [draft-ietf-ipfc-fcmgmt-int-mib-07.txt](#)

The Fibre Channel Management Integration MIB had the following major problems:

- It wasn't formatted using SMIV2, which is mandatory.
- The MIB seemed to have been defined with the notion that it would be the only MIB that a Fibre Channel product will require. The notion of an agent implementing just a single MIB was abandoned by the IETF in 1992 as being non-scaleable. Rather, a Fibre Channel MIB needed to be another MIB in the continuing series of MIBs defined by the IETF, and thus, it needed to be consistent with its predecessors. In other words, there are existing MIBs which all SNMP agents must support, even if the support of Fibre Channel interfaces is the only functionality that they have. Thus, it was essential that the Fibre Channel Integration MIB contained only objects for information which is specific to Fibre Channel. All objects relevant to non-Fibre Channel environments needed to be removed. This issue applied to a large fraction of the objects defined in the MIB.
- The MIB had some but not complete overlap in functionality with [RFC 2837](#).
- Every SNMP agent must implement the ifTable. The ifTable counters are the MIB objects most well-used by administrators in SNMP management. SNMP agents need to implement a row in the ifTable for each of their network interfaces, including their Fibre Channel interfaces. The IF-MIB requires a media-specific MIB to specify how that type of interface uses the ifTable (see section 4 in [RFC 2863](#)). [RFC 2837](#) doesn't do that, and nor did the Fibre Channel Integration MIB.
- It incorrectly used the OCTET STRING syntax (instead of Counter32 or Counter64) for counters.

[13.2.](#) Detailed Changes

[13.2.1.](#) Removal of Sensor-related objects

Information about sensors is not specific to Fibre Channel, and therefore should not be in this MIB. (At the time of writing, the the IETF's ENTITY MIB Working Group has produced a first draft of a Sensor MIB, see [[SENSOR](#)].) This removed the need for:

- connUnitSensorTable (and all its contents)
- connUnitNumSensors
- connUnitSensorStatusChange

[13.2.2.](#) Removal of Trap-registration objects

Information about registering "traps" is not specific to Fibre Channel, and therefore should not be in this MIB. (For similar functionality, see SNMP-NOTIFICATION-MIB and SNMP-TARGET-MIB in [RFC 2573](#)). This removed the need for:

- trapMaxClients
- trapClientCount
- trapRegTable (and all its contents)

[13.2.3.](#) Removal of Event-related objects

Information about generic events is not specific to Fibre Channel, and therefore should not be in this MIB. (For similar functionality, see the Event group in [RFC 2819](#) and the Notification Log MIB in [RFC 3014](#); the SNMP-NOTIFICATION-MIB provides for the filtering of notifications.) This removed the need for:

- connUnitEventTable (and all its contents)
- connUnitEventFilter
- connUnitNumEvents
- connUnitMaxEvents
- connUnitEventCurrID

[13.2.4.](#) Removal of inventory-related information

Aspects of hardware (physical) components are represented in the Entity MIB ([RFC 2737](#)); aspects of software modules are represented in the Host Resources MIB ([RFC 2790](#)). Two new objects provide indexing from this MIB into those MIBs: one having the value of PhysicalIndex (or zero) and the other having the value of hrSWInstalledIndex (or zero). These replaced the need for:

- connUnitNumports
- connUnitRevsTable (and all its contents)
- connUnitNumRevs
- connUnitPortRevision
- connUnitPortVendor
- connUnitProduct
- connUnitInfo
- connUnitSn
- connUnitModuleId
- connUnitVendorId
- connUnitDeletedTrap

[13.2.5.](#) Removal of revision numbers

The forward/backward compatibility rules of how to evolve MIBs are designed such that MIBs do not have revision numbers. This removed the need for:

- revisionNumber

[13.2.6.](#) Removal of other not FC-specific information

Other information was removed because it was not specific to Fibre Channel:

systemURL
statusChangeTime
configurationChangeTime
connUnitUrl
connUnitUpTime
connUnitState
connUnitContact
connUnitLocation
connUnitProxyMaster
connUnitControl
connUnitStatus

Expires June 2005

[Page 72]

Internet Draft

Fibre Channel Management MIB

December 2004

connUnitStatusChange

[13.2.7.](#) Clean-up of ambiguous/obsolete definitions

Some information in the FC Management integration was obsolete or ambiguous:

statusChangeTime (obsolete)
configurationChangeTime (obsolete)
connUnitTableChangeTime (obsolete)
connUnitStatusChangeTime (obsolete)
connUnitConfigurationChangeTime (obsolete)
connUnitNumZones (obsolete)
connUnitZoneTable (referenced but not defined)
connUnitLinkCurrIndex (badly defined)

[13.2.8.](#) Use of an ifTable entry

The following objects were removed because they duplicated existing IF-MIB objects:

redundant object	existing object(s)
-----	-----
connUnitPortStatCountError	ifInErrors & ifOutErrors
connUnitPortStatCountTxObjects	ifOutUcastPkts &

connUnitPortStatCountRxObjects	ifHCOutUcastPkts ifInUcastPkts & ifHCInUcastPkts
connUnitPortStatCountTxElements	ifOutOctets & ifHCOutOctets
connUnitPortStatCountRxElements	ifInOctets & ifHCInOctets
connUnitPortStatCountRxMulticastObjects	ifInMulticastPkts & ifHCInMulticastPkts
connUnitPortStatCountTxMulticastObjects	ifOutMulticastPkts & ifHCOutMulticastPkts
connUnitPortStatCountRxBroadcastObjects	ifInBroadcastPkts & ifHCInBroadcastPkts
connUnitPortStatCountTxBroadcastObjects	ifOutBroadcastPkts & ifHCOutBroadcastPkts
connUnitPortFCId	ifPhysAddress

Expires June 2005

[Page 73]

Internet Draft

Fibre Channel Management MIB

December 2004

connUnitPortControl	ifAdminStatus
connUnitPortState	ifAdminStatus
connUnitPortHWState	ifOperStatus
connUnitPortStatus	ifOperStatus
connUnitPortName	ifAlias
connUnitPortStatObject	ifSpecific
connUnitNumports	ifNumber
connUnitPortStatusChange	linkUp/linkDown

13.2.9. Removed because of AgentX difficulty

An AgentX environment [[RFC2741](#)] consists of a master agent and several sub-agents. It is not difficult to implement the same MIB in several such sub-agents if all of the MIB's tables have a common index variable as the first auxiliary object in their INDEX clauses. However, any scalars which the MIB contains pose a problem for the AgentX environment. All the (remaining) scalars were therefore removed:

revisionNumber

uNumber
systemURL

[13.2.10.](#) FC Management Instance

The term "connectivity unit" was changed to "FC management instance".

The term "connectivity unit" was not properly defined in [draft-ietf-ipfc-fcmgmt-int-mib-07.txt](#), and its usage provided a confused mixture of indications to the implementor:

- the definition of FcUnitType suggested it was functional;
- the definition of uNumber suggested it was physical;
- the definition of connUnitProduct suggested it was a vendor's product;
- etc.

The common implementation strategy for "connectivity unit" was whatever grouping was easiest in providing access to the management functionality. (One such grouping accommodates a single SNMP agent having multiple AgentX [[RFC2741](#)] sub-agents, each supporting a separate implementation of the MIB.)

In fact, this scenario is not new; in practice, a "connectivity unit" will have the same semantics as a management "instance" in other MIBs, e.g., the IPS WG's own iSCSI MIB. For this MIB, its meaning is: "a separable managed instance of Fibre Channel functionality". Given this

Expires June 2005

[Page 74]

Internet Draft

Fibre Channel Management MIB

December 2004

definition, then "FC management instance" is a better name because it is more accurate and more representative of the definition, than is "connectivity unit".

[13.2.11.](#) Counter Syntax

All packet and octet counters have been changed to be Counter64's (but Counter32 versions of them are also included for use by old agents). The error counters have been changed to Counter32's. (In the probably impossible, and at most improbable, circumstances that the rate of occurrence of errors, even on a 10Gbs Fibre Channel interface, might wrap faster than a hour, the fact that errors are occurring will almost certainly be apparent from other MIB objects.)

[13.2.12](#). Obsolete/Little-Used Fibre Channel features

Information relating to Fibre Channel features which are obsolete or not widely-implemented has been deleted. (For more information, see section [6.2.1](#) and section 6.2.2 of [[FC-MI](#)].)

- Class 1 service,
- Intermix Mode,
- Stacked Conn Mode.
- PH version numbers

Note that with support for Class 1 service being deleted, only class 2 now needs F_BSY, F_RJT, P_BSY and P_RJT counters, and thus they no longer need to be counted for all classes as well as for class 2, and therefore these objects:

```
connUnitPortStatCountFBSYFrames
connUnitPortStatCountPBSYFrames
connUnitPortStatCountFRJTFrames
connUnitPortStatCountPRJTFrames
```

have been deleted.

[13.3](#). Name Server objects

A table of Name Server information was present in [draft-ietf-ipfc-fcmgmt-int-mib-07.txt](#). That information is not currently represented in this MIB, because this MIB is already quite large, and a set of Name Server objects are expected to be defined in a separate (new) MIB.

[13.4](#). Additional objects

Support for Class F traffic, including 32-bit octet and frame counters, has been added.

This MIB is a superset of [RFC 2837](#), except for the following:

- the fcFeClass1AccountingGroup group is obsolete,
- fcFxpPortConnectedNxPort, fcFxpPortFcphVersionHigh, fcFxpPortFcphVersionLow, fcFxpPortFcphVersionAgreed, fcFxpPortStackedConnModeAgreed, fcFxpPortIntermixSuppAgreed, fcFxpPortCapStackedConnMode and fcFxpPortCapIntermix are obsolete,
- fcFxpPortBbCredit and fcFxpPortRxBufSize are per attached Nx_Port,
- fcFxpPortBbCreditAvailable is ephemeral,
- fcFeModuleTable is mostly contained in the entPhysicalTable,
- fcFxpPortPhysAdminStatus, fcFxpPortPhysOperStatus, and fcFxpPortPhysLastChange have equivalents in the ifTable.

15. Author's Address

Keith McCloghrie
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA USA 95134
Phone: +1 408-526-5260
Email: kzm@cisco.com

16. Full Copyright Statement

Copyright (C) The Internet Society (2004). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

"Copyright (C) The Internet Society (2004). This document is subject to the rights, licenses and restrictions contained in [BCP 78](#), and except as set forth therein, the authors retain all their rights."

"This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET

Internet Draft

Fibre Channel Management MIB

December 2004

ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED,
INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE
INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE."

Expires June 2005

[Page 79]