

Internet Draft

C. DeSanti  
V. Gaonkar  
K. McCloghrie  
S. Gai  
Cisco Systems  
18 November 2005

Fibre Channel Fabric Address Manager MIB  
draft-ietf-imss-fc-fam-mib-03.txt

Status of this Memo

By submitting this Internet-Draft, each author represents that any applicable patent or other IPR claims of which he or she is aware have been or will be disclosed, and any of which he or she becomes aware will be disclosed, in accordance with [Section 6 of BCP 79](#).

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/lid-abstracts.html>

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

Copyright notice

Copyright(C) The Internet Society (2005). 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 a Fibre Channel network's Fabric Address Manager.

---

Internet Draft   Fibre Channel Fabric Address Manager MIB   November 2005

## Table of Contents

<a href="#">1</a>	Introduction .....	<a href="#">3</a>
<a href="#">2</a>	The Internet-Standard Management Framework .....	<a href="#">3</a>
<a href="#">3</a>	Short Overview of Fibre Channel .....	<a href="#">3</a>
<a href="#">4</a>	Relationship to Other MIBs .....	<a href="#">4</a>
<a href="#">5</a>	MIB Overview .....	<a href="#">5</a>
<a href="#">5.1</a>	Fibre Channel management instance .....	<a href="#">5</a>
<a href="#">5.2</a>	Switch Index .....	<a href="#">5</a>
<a href="#">5.3</a>	Fabric Index .....	<a href="#">5</a>
<a href="#">5.4</a>	The t11FamGroup group .....	<a href="#">6</a>
<a href="#">5.5</a>	The t11FamDatabaseGroup group .....	<a href="#">6</a>
<a href="#">5.6</a>	The t11FamAreaGroup group .....	<a href="#">6</a>
<a href="#">5.7</a>	The t11FamCacheGroup group .....	<a href="#">6</a>
<a href="#">5.8</a>	The t11FamCommandGroup group .....	<a href="#">6</a>
<a href="#">5.9</a>	The t11FamNotificationGroup group .....	<a href="#">7</a>
<a href="#">5.10</a>	Use of RCF and BF .....	<a href="#">7</a>
<a href="#">6</a>	Definitions .....	<a href="#">8</a>
<a href="#">6.1</a>	The T11-TC-MIB Module .....	<a href="#">8</a>
<a href="#">6.2</a>	The T11-FC-FABRIC-ADDR-MGR-MIB Module .....	<a href="#">10</a>
<a href="#">7</a>	Intellectual Property .....	<a href="#">38</a>
<a href="#">8</a>	Acknowledgements .....	<a href="#">38</a>
<a href="#">9</a>	Normative References .....	<a href="#">39</a>
<a href="#">10</a>	Informative References .....	<a href="#">40</a>
<a href="#">11</a>	IANA Considerations .....	<a href="#">40</a>
<a href="#">12</a>	Security Considerations .....	<a href="#">40</a>
<a href="#">13</a>	Authors' Addresses .....	<a href="#">42</a>

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

## 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 a Fibre Channel network's Fabric Address Manager. Fabric Address Manager refers to the functionality of acquiring DomainID(s) as specified in [[FC-SW-3](#)], and managing Fibre Channel Identifiers as specified in [[FC-FS](#)].

## 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. Fibre Channel provides a general transport vehicle for higher level protocols such as 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.

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 [[FC-FS](#)]. 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 both an address identifier and a WWN. When a fabric is in use, the FC address identifiers are dynamically assigned by a switch. Each octet of a 24-bit address represents a level in an address hierarchy, with a Domain\_ID being the highest level of the hierarchy.

Each Switch in a Fabric is assigned one (or more) unique Domain\_IDs using a two-step process. First, one switch, called Principal Switch, is selected from the switches of a Fabric. Then, the Principal Switch assigns Domain\_IDs to the other switches of the Fabric. Address assignment within a Domain is performed by the switch to which that Domain\_ID is granted.

#### [4.](#) Relationship to Other MIBs

The first standardized MIB for Fibre Channel [[RFC2837](#)] was focused on Fibre Channel switches. It is being replaced by the more generic Fibre Channel Management MIB [[FC-MGMT](#)] which defines basic

information for Fibre Channel hosts and switches, including extensions to the standard IF-MIB [[IF-MIB](#)] for Fibre Channel interfaces. [[FC-MGMT](#)] includes the specification of how the generic objects defined in [[IF-MIB](#)] apply to Fibre Channel interfaces.

Note that an interface's ifIndex value must be unique within an SNMP context, irrespective of how many Fibre Channel management instances (see below) and how many Fibre Channel switches are instrumented within that SNMP context.

This document defines the T11-FC-FABRIC-ADDR-MGR-MIB module which extends beyond [[FC-MGMT](#)] to cover the functionality, in Fibre Channel

Expires May 2006

[Page 4]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

switches, which is used to manage fabric configuration, domains, and addresses within a domain.

This document also contains a MIB module, T11-TC-MIB, to define Textual Conventions which might also be useful in other MIBs defined by T11.

## [5.](#) MIB Overview

This section explains the use of a Fibre Channel management instance, a Switch Index, and a Fabric Index. It also describes the six MIB groups contained in the MIB.

### [5.1.](#) Fibre Channel management instance

A Fibre Channel management instance is defined in [[FC-MGMT](#)] 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 sub-agents, with each sub-agent implementing a different Fibre Channel management instance.

The object, fcmInstanceIndex, is IMPORTed from the FC-MGMT-MIB [[FC-MGMT](#)] as the index value to uniquely identify a Fibre Channel management instance.

## [5.2.](#) Switch Index

The FC-MGMT-MIB [[FC-MGMT](#)] defines the fcmSwitchTable as 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. The Switch Index, fcmSwitchIndex, is IMPORTed from the FC-MGMT-MIB as the index value to uniquely identify a Fibre Channel switch amongst those (one or more) managed by the same Fibre Channel management instance.

## [5.3.](#) Fabric Index

The current standard for an interconnecting Fabric consisting of multiple Fabric Switch elements is [[FC-SW-3](#)], which describes the operation of a single Fabric in a physical infrastructure. Forthcoming standards, e.g., [[FC-SW-4](#)], will likely define how multiple Fabrics could operate within one (or more) physical

infrastructures. In such a scenario, each Fabric would, of course, have its own management instrumentation. Therefore, to allow for this possibility, this MIB defines all Fabric-related information in tables which are INDEX-ed by an arbitrary integer, named a "Fabric Index". In a Fabric which is conformant to [[FC-SW-3](#)], the value of this Fabric Index will always be 1.

It is quite possible, and may even become likely, that (a port of) a Fibre Channel switch will be connected to multiple such Fabrics. Thus, in order to simplify a query concerning all the Fabrics to which a single switch is connected, fcmSwitchIndex will be listed before t11FamFabricIndex when they both appear in the same INDEX clause.

## [5.4.](#) The t11FamGroup group

This group contains basic information about the Fabric Address Manager functionality within a switch, including its configuration parameters which are per-interface (i.e., specified for a particular Fibre Channel interface identified by an ifIndex value).

#### [5.5.](#) The t11FamDatabaseGroup group

This group contains information about which switches are assigned to which domains.

#### [5.6.](#) The t11FamAreaGroup group

This group contains information about which Port-IDs have been assigned within the Areas of the local Domain.

#### [5.7.](#) The t11FamCacheGroup group

This conditional mandatory group contains information about all the FC address identifier assignments which have been recently released. This cache is kept to support the concept of Preferred Domain\_ID via a best effort attempt for (short-term) re-assignment of the same FC address identifiers.

#### [5.8.](#) The t11FamCommandGroup group

This optional group contains objects used for initiating an operation on a Fabric.

Expires May 2006

[Page 6]

---

Internet Draft    Fibre Channel Fabric Address Manager MIB    November 2005

#### [5.9.](#) The t11FamNotificationGroup group

This group contains notifications of significant events concerning the Fabric Address management functionality within a switch.

#### [5.10.](#) Use of RCF and BF

Included in [[FC-SW-3](#)] is the specification of Reconfigure Fabric (RCF) and Build Fabric (BF), both of which are command-codes of the Switch Fabric Internal Link Service (SW\_ILS). [[FC-SW-3](#)] includes the warning:

NOTE 13 - Since the RCF causes a complete reconfiguration of the Fabric, and may cause addresses allocated to a Switch to change, this SW\_ILS should be used with caution. The BF SW\_ILS allows the

Fabric to attempt reconfiguration without loss of or change of address and therefore should be attempted before an RCF. Examples of situations in which RCF may be appropriate include resolution of overlapped Domains, or the failure of a Fabric Reconfiguration initiated by a BF.

Further, [\[FC-MI\]](#) specifies

A Fabric is prohibited from autonomously generating a RCF, but an outside administrative function may request a switch to generate an RCF. Such an administrative function is outside the scope of this technical report.

The T11-FC-FABRIC-ADDR-MGR-MIB defined in this document is consistent with both of the above quotes since it defines two objects, t11FamAutoReconfigure and t11FamRestart, which are defined with a MAX-ACCESS of read-write, and setting them to the appropriate value is a means by which "an outside administrative function may request a switch to generate an RCF" [\[FC-MI\]](#).

Note, however, the MIB specifies in its compliance section that the minimum required level of support for these two objects is read-only.

Further, for both t11FamAutoReconfigure and t11FamRestart, the MIB serves only as a request to generate; it does not represent the action of the RCF or BF. That is, a successful SNMP SetRequest on these objects will cause an RCF (or BF) to be sent, but SNMP does not/can not ensure the successful operation of the SW\_ILS operation.

Expires May 2006

[Page 7]

---

Internet Draft   Fibre Channel Fabric Address Manager MIB   November 2005

## [6.](#) Definitions

### [6.1.](#) The T11-TC-MIB Module

```
T11-TC-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, Unsigned32, mib-2
```

```
    FROM SNMPv2-SMI -- \[RFC2578\]
```



TEXTUAL-CONVENTION

FROM SNMPv2-TC; -- [[RFC2579](#)]

t11TcMIB MODULE-IDENTITY

LAST-UPDATED "200511180000Z"

ORGANIZATION "T11"

CONTACT-INFO

" Claudio DeSanti  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134 USA  
Phone: +1 408 853-9172  
EMail: cds@cisco.com

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

DESCRIPTION

"This module defines textual conventions used in T11 MIBs.

Copyright (C) The Internet Society (2005). This version  
of this MIB module is part of RFC yyyy; see the RFC  
itself for full legal notices."

-- RFC Editor: replace yyyy with actual RFC number & remove this note

REVISION "200511180000Z"

DESCRIPTION

"Initial version of this MIB module, published as RFCyyyy."

-- RFC-Editor, replace yyyy with actual RFC number & remove this note

::= { mib-2 XXX } -- to be assigned by IANA

-- RFC Editor: replace XXX with IANA-assigned number & remove this note

T11FabricIndex ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

Expires May 2006

[Page 8]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

DESCRIPTION

"A Fabric Index which is used as a unique  
index value to identify a particular Fabric within

one (or more) physical infrastructures.

In an environment which is conformant to FC-SW-3, where there is always exactly one Fabric in a single physical infrastructure, the value of this Fabric Index will always be 1.

However, the forthcoming standard, FC-SW-4, defines how multiple Fabrics, each with its own management instrumentation, could operate within one (or more) physical infrastructures. When such multiple fabrics are in use, this index value is used to uniquely identify a particular Fabric within a physical infrastructure.

Note that the value of this TC has a range of (0..4095) so as to be consistent with FC-SW-4, which says that a 'VF\_ID Bitmap' is 512 bytes long, with the high-order bit representing VF\_ID zero, and the low-order bit representing 4095."

REFERENCE "Fibre Channel - Switch Fabric - 4 (FC-SW-4),  
Rev 7.1, October 2004, [section 6.1.27.2.4](#)."  
SYNTAX Unsigned32 (0..4095)

END

## 6.2. The T11-FC-FABRIC-ADDR-MGR-MIB Module

```
T11-FC-FABRIC-ADDR-MGR-MIB DEFINITIONS ::= BEGIN
```

```
-- the Fibre Channel Fabric Address Manager MIB
--
-- for management of the functionality, in Fibre Channel switches,
-- which is used to manage fabric configuration, domains, and
-- addresses within a domain.
--
```

### IMPORTS

```
MODULE-IDENTITY, OBJECT-TYPE,
NOTIFICATION-TYPE, Unsigned32,
Counter32, Gauge32, mib-2          FROM SNMPv2-SMI    -- [RFC2578]
MODULE-COMPLIANCE, OBJECT-GROUP,
NOTIFICATION-GROUP                FROM SNMPv2-CONF  -- [RFC2580]
TEXTUAL-CONVENTION, TruthValue,
RowStatus                          FROM SNMPv2-TC     -- [RFC2579]
ifIndex                             FROM IF-MIB       -- [IF-MIB]
fcmInstanceIndex, fcmSwitchIndex,
FcDomainIdOrZero, FcNameIdOrZero   FROM FC-MGMT-MIB -- [FC-MGMT]
T11FabricIndex                     FROM T11-TC-MIB;
```

```
t11FcFabricAddrMgrMIB MODULE-IDENTITY
```

```
LAST-UPDATED "200510120000Z"
```

```
ORGANIZATION "T11"
```

```
CONTACT-INFO
```

```
"      Claudio DeSanti
      Cisco Systems, Inc.
      170 West Tasman Drive
      San Jose, CA 95134 USA
      Phone: +1 408 853-9172
      EMail: cds@cisco.com
```

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

```
DESCRIPTION
```

```
"The MIB module for the Fabric Address management
functionality defined by the Fibre Channel standards. For
the purposes of this MIB, Fabric Address Manager refers to
```

---

Internet Draft   Fibre Channel Fabric Address Manager MIB   November 2005

the functionality of acquiring DomainID(s) as specified in FC-SW-3, and managing Fibre Channel Identifiers as specified in FC-FS. An instance of 'Fabric Address Manager' software functionality executes in the principal switch, and in each other switch.

After an agent reboot, the values of read-write objects defined in this MIB module are implementation-dependent.

Copyright (C) The Internet Society (2005). This version of this MIB module is part of RFC yyyy; see the RFC itself for full legal notices."

```
-- RFC Editor: replace yyyy with actual RFC number & remove this note
REVISION      "200510120000Z"
DESCRIPTION
    "Initial version of this MIB module, published as RFCyyyy."
-- RFC-Editor, replace yyyy with actual RFC number & remove this note
 ::= { mib-2 XXX } -- to be assigned by IANA
-- RFC Editor: replace XXX with IANA-assigned number & remove this note

t11FamNotifications    OBJECT IDENTIFIER ::= { t11FcFabricAddrMgrMIB 0 }
t11FamMIBObjects       OBJECT IDENTIFIER ::= { t11FcFabricAddrMgrMIB 1 }
t11FamMIBConformance  OBJECT IDENTIFIER ::= { t11FcFabricAddrMgrMIB 2 }
t11FamConfiguration   OBJECT IDENTIFIER ::= { t11FamMIBObjects 1 }
t11FamInfo             OBJECT IDENTIFIER ::= { t11FamMIBObjects 2 }
t11FamNotifyControl   OBJECT IDENTIFIER ::= { t11FamMIBObjects 3 }

-- Textual Conventions
T11FamDomainPriority ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS      current
    DESCRIPTION
        "Priority of a switch.
        The principal switch selection is influenced by the
        priority of the switches.
        Some values are of importance are:

        1   : The highest priority in principal switch
              selection, which is used by the administrator
              to establish which switch becomes the principal
              switch.
```

255 : Indicates that the switch is not capable of acting as a principal switch."  
REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3), ANSI INCITS 384-2004, [section 6.1.5](#)."

Expires May 2006

[Page 11]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

SYNTAX Unsigned32 (1..255)

T11FamDomainInterfaceRole ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The 'designated' state/role of the ISL to which an interface connects, or (if not connected) the state of the interface:

nonPrincipal (1) - non-Principal ISL  
principalUpstream (2) - Upstream Principal ISL  
principalDownstream (3) - Downstream Principal ISL  
isolated (4) - interface is isolated  
down (5) - interface is down  
unknown (6) - state/role is unknown  
"

REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3), ANSI INCITS 384-2004, Sections [3.1](#), [5.7](#), and Figure 9."

SYNTAX INTEGER {  
nonPrincipal (1),  
principalUpstream (2),  
principalDownstream (3),  
isolated (4),  
down (5),  
unknown (6)  
}

T11FamState ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The state of the Fabric Address Manager, as described in FC-SW-3's Table 86 and Figure 15.

- 'other' represents a switch which is in a state not represented by any of the below enumerations,

- 'starting' represents a switch engaged in the process represented by the first row in Table 86,
- 'unconfigured' represents a switch which requires operator input before it can begin the process represented by the first row in Table 86,
- 'principalSwitchSelection' represents a switch engaged in the process represented by the second row in

Table 86, but not in states F0 or F1 of Figure 15.

- 'domainIdDistribution' represents a switch engaged in the process represented by the third row in Table 86,
- 'buildFabricPhase' represents a switch which is in state F0 of Figure 15,
- 'reconfigureFabricPhase' represents a switch which is in state F1 of Figure 15,
- 'stable' represents a switch which has successfully completed the process represented by the third row in Table 86 and has at least one E\_Port,
- 'stableWithNoEports' represents a switch which has successfully completed the process represented by the third row in Table 86 but has no E\_Ports,
- 'noDomains' represents a switch which has completed the process represented by the third row in Table 86 but failed to obtain a Domain\_ID,
- 'disabled' represents any situation in which the corresponding instance of t11FamEnable has value 'false',
- 'unknown' represents a switch which is confused about what state it is in."

```
REFERENCE    "Fibre Channel - Switch Fabric - 3 (FC-SW-3),
              ANSI INCITS 384-2004, Table 86 and Figure 15."
SYNTAX      INTEGER {
              other(1),
              starting(2),
              unconfigured(3),
              principalSwitchSelection(4),
              domainIdDistribution(5),
              buildFabricPhase(6),
              reconfigureFabricPhase(7),
              stable(8),
              stableWithNoEports(9),
              noDomains(10),
              disabled(11),
              unknown(12)
            }
```

Expires May 2006

[Page 13]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

```
--
-- t11FamTable
--
```

t11FamTable OBJECT-TYPE

SYNTAX SEQUENCE OF T11FamEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains Fabric Address Manager related parameters which are able to be configured and monitored in a Fibre Channel switch. For each of the switches (identified by fcmSwitchIndex) managed by a Fibre Channel management instance (identified by fcmInstanceIndex), there is any entry for each Fabric known to that switch. Entries are implicitly created/removed if and when additional Fabrics are created/deleted."

::= { t11FamConfiguration 1 }

t11FamEntry OBJECT-TYPE

SYNTAX T11FamEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry provides information on the local Fabric Address Manager functionality for a Fabric known to a particular switch."

INDEX { fcmInstanceId, fcmSwitchIndex, t11FamFabricIndex }  
 ::= { t11FamTable 1 }

```
T11FamEntry ::= SEQUENCE {
    t11FamFabricIndex          T11FabricIndex,
    t11FamConfigDomainId      FcDomainIdOrZero,
    t11FamConfigDomainIdType  INTEGER,
    t11FamAutoReconfigure     TruthValue,
    t11FamContiguousAllocation TruthValue,
    t11FamPriority             T11FamDomainPriority,
    t11FamPrincipalSwitchWwn  FcNameIdOrZero,
    t11FamLocalSwitchWwn     FcNameIdOrZero,
    t11FamAssignedAreaIdList  OCTET STRING,
    t11FamGrantedFcIds        Counter32,
    t11FamRecoveredFcIds      Counter32,
    t11FamFreeFcIds           Gauge32,
    t11FamAssignedFcIds       Gauge32,
    t11FamAvailableFcIds      Gauge32,
```

```
    t11FamRunningPriority      T11FamDomainPriority,
    t11FamPrincSwRunningPriority T11FamDomainPriority,
    t11FamState                T11FamState,
    t11FamLocalPrincipalSwitchSlctns Counter32,
    t11FamPrincipalSwitchSelections Counter32,
    t11FamBuildFabrics         Counter32,
    t11FamFabricReconfigures   Counter32,
    t11FamDomainId             FcDomainIdOrZero,
    t11FamSticky                TruthValue,
    t11FamRestart               INTEGER,
    t11FamRcFabricNotifyEnable TruthValue,
    t11FamEnable                TruthValue,
    t11FamFabricName           FcNameIdOrZero
}
```

t11FamFabricIndex OBJECT-TYPE  
SYNTAX T11FabricIndex



MAX-ACCESS not-accessible  
STATUS current  
DESCRIPTION

"A unique index value which uniquely identifies a particular Fabric known to a particular switch.

In a Fabric conformant to FC-SW-3, only a single Fabric can operate within a physical infrastructure, and thus, the value of this Fabric Index will always be 1.

However, the forthcoming standard, FC-SW-4, defines how multiple Fabrics, each with its own management instrumentation, could operate within one (or more) physical infrastructures. When such multiple fabrics are in use, this index value is used to uniquely identify a particular Fabric within a physical infrastructure."

::= { t11FamEntry 1 }

t11FamConfigDomainId OBJECT-TYPE

SYNTAX FcDomainIdOrZero

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The configured Domain\_ID of the particular switch on this Fabric, or zero if no Domain\_ID has been configured. The meaning of this object depends on t11FamConfigDomainIdType object.

If t11FamConfigDomainIdType is 'preferred', then the configured Domain\_ID is called the 'preferred Domain\_ID'. Valid values are between 0 and 239. In a situation where this Domain\_ID can not be assigned, any other Domain\_ID will be acceptable. A value of zero means any Domain\_ID.

If t11FamConfigDomainIdType is 'insistent', then the configured Domain\_ID is called the 'insistent Domain\_ID' and valid values are between 1 and 239. In a situation where this Domain\_ID can not be assigned, no other Domain\_ID is acceptable.

In both of the above cases, the switch sends an RDI (Request Domain\_ID) to request this Domain\_ID to the Principal Switch. If no Domain\_ID is able to be granted in the case of 'preferred', or if an 'insistent' Domain\_ID is configured but not able to be granted, then it is an error condition. When this error occurs, the switch will continue as if it receives a SW\_RJT with a reason/explanation of 'Unable to perform command request'/'Domain\_ID not available'. That is, its E\_Ports on that Fabric will be isolated and the administrator informed via a 't11FamDomainIdNotAssigned' notification.

If t11FamConfigDomainIdType is 'static', then the configured Domain\_ID is called the 'static Domain\_ID' and valid values are between 1 and 239. In this situation, there is no Principal Switch in the Fabric and the Domain\_ID is simply assigned by configuration, together with the Fabric\_Name. A switch configured with a static Domain\_ID, on receiving an EFP, BF, RCF, DIA or RDI SW\_ILS shall reply with an SW\_RJT having Reason Code Explanation 'E\_Port is Isolated' and shall isolate the receiving E\_Port.

For the persistence of values across reboots, see the MODULE-IDENTITY's DESCRITPION clause."

REFERENCE "Fibre Channel - Switch Fabric - 4 (FC-SW-4),  
Rev 7.1, October 2004, [section 7](#)."

DEFVAL { 0 }

::= { t11FamEntry 2 }

t11FamConfigDomainIdType OBJECT-TYPE

SYNTAX INTEGER {  
preferred(1),  
insistent(2),

Expires May 2006

[Page 16]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

static(3)  
}  
MAX-ACCESS read-write  
STATUS current  
DESCRIPTION

"Type of configured Domain\_ID contained in  
t11FamConfigDomainId.

For the persistence of values across reboots, see the  
MODULE-IDENTITY's DESCRITPION clause."

DEFVAL { preferred }  
::= { t11FamEntry 3 }

#### t11FamAutoReconfigure OBJECT-TYPE

SYNTAX TruthValue  
MAX-ACCESS read-write  
STATUS current  
DESCRIPTION

"This object determines how a particular switch  
responds to certain error conditions.

The condition that might cause these errors is  
the merging of two disjoint fabrics that have  
overlapping Domain\_ID list.

If value of this object is 'true', the switch will  
send a RCF (ReConfigureFabric) to rebuild the  
Fabric.

If 'false' the switch will isolate the E\_Ports on  
which the errors happened.

For the persistence of values across reboots, see the  
MODULE-IDENTITY's DESCRITPION clause."

REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3),  
December 2003, sections [6.1.12](#) & 7.3.  
Fibre Channel - Methodologies for Interconnects  
(FC-MI), December 2001, table 14, note g."

DEFVAL { false }  
::= { t11FamEntry 4 }

#### t11FamContiguousAllocation OBJECT-TYPE

SYNTAX TruthValue  
MAX-ACCESS read-write  
STATUS current

## DESCRIPTION

"Determines how a particular switch behaves when elected as the principal switch.

If true, the switch will only accept RDIs with a contiguous allocation; specifically, it will reject RDIs with non-contiguous Domain\_IDs, and if an RDI for a contiguous Domain\_ID is not able to be fulfilled, it will try to replace all the Domain\_IDs in the list with contiguous Domain\_IDs, and if that fails, the RDI will be rejected.

If false, then the switch acts normally in granting the Domain\_IDs even if they are not contiguous.

For the persistence of values across reboots, see the MODULE-IDENTITY's DESCRIPTION clause."

```
::= { t11FamEntry 5 }
```

t11FamPriority OBJECT-TYPE

SYNTAX T11FamDomainPriority

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The initial or configured priority of a particular switch to be used in principal switch selection process.

For the persistence of values across reboots, see the MODULE-IDENTITY's DESCRIPTION clause."

```
::= { t11FamEntry 6 }
```

t11FamPrincipalSwitchWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The WWN of the Principal Switch on this Fabric, or zero-length string if the identity of the principal switch is unknown."

DEFVAL { 'H' }

```
::= { t11FamEntry 7 }
```

t11FamLocalSwitchWwn OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

---

Internet Draft   Fibre Channel Fabric Address Manager MIB   November 2005

DESCRIPTION

"The WWN of the particular Switch on this Fabric."  
 ::= { t11FamEntry 8 }

t11FamAssignedAreaIdList    OBJECT-TYPE  
SYNTAX            OCTET STRING (SIZE(0..256))  
MAX-ACCESS read-only  
STATUS            current  
DESCRIPTION

"The list of (zero or more) Area\_IDs which have been assigned by a particular switch in this Fabric, formatted as an array of octets in ascending order.

Each octet represents one Area\_ID. So, the list containing Area\_IDs: 23, 45, 235 and 56 would be formatted as the 4-octet string x'172d38eb'.

A particular Area's Area\_ID is used as the index into the t11FamAreaTable to get the statistics on that Area."

::= { t11FamEntry 9 }

t11FamGrantedFcIds OBJECT-TYPE  
SYNTAX            Counter32  
MAX-ACCESS read-only  
STATUS            current  
DESCRIPTION

"The total number of Fibre Channel Address Identifiers granted (for local use, i.e., with a particular switch's Domain\_ID) by the Fabric Address Manager on that switch.

This counter has no discontinuities other than those which all Counter32's have when sysUpTime=0."

::= { t11FamEntry 10 }

t11FamRecoveredFcIds OBJECT-TYPE  
SYNTAX            Counter32  
MAX-ACCESS read-only  
STATUS            current  
DESCRIPTION

"The total number of Fibre Channel Address Identifiers that have been recovered by the Fabric Address Manager on a particular switch since the switch has been initialized. A recovered Fibre Channel Address Identifier is one that is

explicitly returned after previously being used.

Expires May 2006

[Page 19]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

This counter has no discontinuities other than those which all Counter32's have when sysUpTime=0."

::= { t11FamEntry 11 }

t11FamFreeFcIds OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Fibre Channel Address Identifiers that are currently unassigned on this Fabric and could be available for assignment either immediately or at some later time.

The sum of the instances of FreeFcIds and AssignedFcIds corresponding to a particular Fabric is the total number of Fibre Channel Address Identifiers that the local Fabric Address Management is capable of assigning on that Fabric."

::= { t11FamEntry 12 }

t11FamAssignedFcIds OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Fibre Channel Address Identifiers that are currently assigned on this Fabric.

The sum of the instances of FreeFcIds and AssignedFcIds corresponding to a particular Fabric is the total number of Fibre Channel Address Identifiers that the local Fabric Address Management is capable of assigning on that Fabric."

::= { t11FamEntry 13 }

t11FamAvailableFcIds OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of Fibre Channel Address Identifiers that are unassigned and currently available for immediate assignment on the Fabric, e.g., with the 'Clean Address' bit set to 1."

REFERENCE

"Fibre Channel - Framing and Signaling (FC-FS),  
ANSI INCITS 373-2003, [section 15.6.2.4.2](#), April 2003."  
 ::= { t11FamEntry 14 }

Expires May 2006

[Page 20]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

t11FamRunningPriority OBJECT-TYPE

SYNTAX T11FamDomainPriority

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The running priority of a particular switch on this Fabric. This value is initialised to the value of t11FamPriority, and subsequently altered as specified by the procedures defined in FC-SW-3."

::= { t11FamEntry 15 }

t11FamPrincSwRunningPriority OBJECT-TYPE

SYNTAX T11FamDomainPriority

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The running priority of the principal switch on this Fabric."

::= { t11FamEntry 16 }

t11FamState OBJECT-TYPE

SYNTAX T11FamState

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The state of the Fabric Address Manager on a particular switch on this Fabric."

::= { t11FamEntry 17 }

t11FamLocalPrincipalSwitchSlctns OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of times a particular switch became the  
    principal switch on this Fabric.  
  
    This counter has no discontinuities other than those  
    which all Counter32's have when sysUpTime=0."  
 ::= { t11FamEntry 18 }

t11FamPrincipalSwitchSelections OBJECT-TYPE

SYNTAX Counter32  
MAX-ACCESS read-only  
STATUS current

Expires May 2006

[Page 21]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

DESCRIPTION  
    "The number of principal switch selections on this Fabric.  
  
    This counter has no discontinuities other than those  
    which all Counter32's have when sysUpTime=0."  
 ::= { t11FamEntry 19 }

t11FamBuildFabrics OBJECT-TYPE

SYNTAX Counter32  
MAX-ACCESS read-only  
STATUS current

DESCRIPTION  
    "The number of non-disruptive fabric reconfigurations (BFs)  
    that have occurred on this Fabric.

    This counter has no discontinuities other than those  
    which all Counter32's have when sysUpTime=0."  
 ::= { t11FamEntry 20 }

t11FamFabricReconfigures OBJECT-TYPE

SYNTAX Counter32  
MAX-ACCESS read-only  
STATUS current

DESCRIPTION  
    "The number of disruptive fabric reconfigurations (RCFs)



that have occurred on this Fabric.

This counter has no discontinuities other than those which all Counter32's have when sysUpTime=0."

::= { t11FamEntry 21 }

t11FamDomainId OBJECT-TYPE  
SYNTAX FcDomainIdOrZero  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The Domain\_ID of a particular switch on this Fabric or zero if no Domain\_ID has been assigned."  
::= { t11FamEntry 22 }

t11FamSticky OBJECT-TYPE  
SYNTAX TruthValue  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION

Expires May 2006

[Page 22]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

"An indication of whether a particular switch is supporting the concept of Preferred Domain\_IDs via a best effort attempt to re-assign the same Fibre Channel Address Identifier value to a port on the next occasion when a port requests an assignment on this Fabric.

If the value of this object is 'true', then the switch is maintaining rows in the t11FamFcIdCacheTable for this Fabric."

::= { t11FamEntry 23 }

t11FamRestart OBJECT-TYPE  
SYNTAX INTEGER {  
nonDisruptive(1),  
disruptive(2),  
noOp(3)  
}  
MAX-ACCESS read-write  
STATUS current

DESCRIPTION

"This object tells the Fabric Address Manager to request a fabric reconfiguration.

If this object is set to 'disruptive', then a RCF (ReConfigure Fabric) is generated in the Fabric in order for the fabric to recover from the errors.

If this object is set to 'nonDisruptive', then a BF (Build Fabric) is generated in the Fabric.

No action is taken if this object is set to 'noOp'. The value of the object when read is always 'noOp'.

For the persistence of values across reboots, see the MODULE-IDENTITY's DESCRIPTION clause."

REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3), ANSI INCITS 384-2004, [section 7.3](#)."

::= { t11FamEntry 24 }

t11FamRcFabricNotifyEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"An indication of whether or not a particular switch

Expires May 2006

[Page 23]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

should issue a t11FamFabricChangeNotify notification on sending or receiving ReConfigureFabric (RCF) on a Fabric.

If the value of the object is 'true', then the notification is generated. If the value is 'false', notification is not generated.

If an implementation requires all fabrics to have the same value, then setting one instance of this object to a new object will result in all corresponding instances being set to that same new value.

For the persistence of values across reboots, see the

MODULE-IDENTITY's DESCRIPTION clause."  
DEFVAL { false }  
::= { t11FamEntry 25 }

t11FamEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Enables the Fabric Address Manager on this switch on this Fabric.

If enabled on a Fabric, the switch will participate in principal switch selection, and Domain\_IDs are assigned dynamically. If disabled, the switch will not participate in principal switch selection, and Domain\_IDs are assigned statically. Thus, the corresponding value of t11FamConfigDomainIdType needs to be 'static'.

For the persistence of values across reboots, see the MODULE-IDENTITY's DESCRIPTION clause."

REFERENCE "Fibre Channel - Switch Fabric - 4 (FC-SW-4),  
Rev 7.1, October 2004, sections [7.1](#) and [7.3](#)."

DEFVAL { true }

::= { t11FamEntry 26 }

t11FamFabricName OBJECT-TYPE

SYNTAX FcNameIdOrZero

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The WWN that is configured on this switch to be used as

the name of this Fabric when the value of t11FamEnable is 'false'.

If the value of t11FamEnable is 'true', this value is not used.

Fibre Channel requires that:

- a) all switches in an operational Fabric be configured with the same Fabric name, and
- b) each Fabric have a unique Fabric name.

If either of these is violated, either by switches within a single Fabric being configured with different Fabric names, or by multiple Fabrics that share management applications or interact in other ways having the same Fabric name, then the behavior of the switches and associated management functions is not specified by Fibre Channel or Internet standards.

For the persistence of values across reboots, see the MODULE-IDENTITY's DESCRIPTION clause."

REFERENCE "Fibre Channel - Switch Fabric - 4 (FC-SW-4),  
Rev 7.1, October 2004, [section 7.1](#)."

::= { t11FamEntry 27 }

--

-- t11FamIfTable - Interface configuration

--

t11FamIfTable OBJECT-TYPE

SYNTAX SEQUENCE OF T11FamIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains those Fabric Address Manager parameters and status values, which are per-interface (identified by an ifIndex value), per-Fabric (identified by a t11FamFabricIndex value), and per-switch (identified by values of fcmInstanceIndex and fcmSwitchIndex).

An entry in this table is automatically created when an E\_Port becomes non-isolated on a particular Fabric.

An entry is deleted automatically from this table if:

- a) the corresponding interface is no longer an E\_Port (e.g.,

a G\_Port which is dynamically determined to be an F\_Port),

and all configuration parameter(s) have default values; or  
b) the interface identified by ifIndex no longer exists  
(e.g., because a line-card is physically removed); or  
c) the row in the t11FamTable corresponding the fabric  
identified by t11FamFabricID no longer exists.

Creating an entry in this table via t11FamIfRowStatus  
provides the means to specify non-default parameter value(s)  
for an interface at a time when the relevant row in this  
table does not exist, i.e., because the interface is either  
down or it is not an E\_Port."

```
::= { t11FamConfiguration 2 }
```

t11FamIfEntry OBJECT-TYPE

```
SYNTAX      T11FamIfEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

```
"An entry containing information on the interface
configuration on the Fabric identified by
t11FamFabricIndex."
```

```
INDEX { fcmInstanceIndex, fcmSwitchIndex,
        t11FamFabricIndex, ifIndex}
```

```
::= { t11FamIfTable 1 }
```

T11FamIfEntry ::= SEQUENCE {

```
t11FamIfRcfReject      TruthValue,
t11FamIfRole           T11FamDomainInterfaceRole,
t11FamIfRowStatus      RowStatus
```

}

t11FamIfRcfReject OBJECT-TYPE

```
SYNTAX      TruthValue
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
```

```
"This object determines if the incoming ReConfigure
Fabric (RCF) messages on this interface on this
Fabric is accepted or not. If this object is 'true', then
the incoming RCF is rejected. If 'false', incoming RCF is
accepted."
```

Note that this object does not apply to the outgoing  
RCFs generated by this interface.

Implementations which support write-access to this object can do so under whatever conditions they choose."

DEFVAL {false}  
 ::= { t11FamIfEntry 1 }

t11FamIfRole OBJECT-TYPE  
 SYNTAX T11FamDomainInterfaceRole  
 MAX-ACCESS read-only  
 STATUS current  
 DESCRIPTION  
 "The role of this interface."  
 ::= { t11FamIfEntry 2 }

t11FamIfRowStatus OBJECT-TYPE  
 SYNTAX RowStatus  
 MAX-ACCESS read-create  
 STATUS current  
 DESCRIPTION  
 "The status of this row."  
 ::= { t11FamIfEntry 3 }

--  
-- t11FamAreaTable  
--

t11FamAreaTable OBJECT-TYPE  
 SYNTAX SEQUENCE OF T11FamAreaEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION  
 "This table contains Area assignments per-Fabric by a switch's Fabric Address Manager. Each octet in t11FamAssignedAreaList is able to be used to index into this table to find information on each Area."  
 REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3), ANSI INCITS 384-2004, [section 4.8](#)."  
 ::= { t11FamInfo 1 }

t11FamAreaEntry OBJECT-TYPE  
 SYNTAX T11FamAreaEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION  
 "An entry gives information on the Area\_ID and all

---

Internet Draft    Fibre Channel Fabric Address Manager MIB    November 2005

Port\_IDs that have been assigned within an Area for the Fabric identified by t11FamFabricIndex, by the Fabric Address Manager in the switch identified by fcmInstanceIndex and fcmSwitchIndex."

```
INDEX { fcmInstanceIndex, fcmSwitchIndex,
        t11FamFabricIndex, t11FamAreaAreaId}
 ::= { t11FamAreaTable 1 }
```

```
T11FamAreaEntry ::= SEQUENCE {
    t11FamAreaAreaId          Unsigned32,
    t11FamAreaAssignedPortIdList  OCTET STRING
}
```

```
t11FamAreaAreaId    OBJECT-TYPE
    SYNTAX            Unsigned32 (0..255)
    MAX-ACCESS        not-accessible
    STATUS             current
    DESCRIPTION
        "The Area_ID of this Area."
    ::= { t11FamAreaEntry 1 }
```

```
t11FamAreaAssignedPortIdList    OBJECT-TYPE
    SYNTAX            OCTET STRING (SIZE(0..256))
    MAX-ACCESS        read-only
    STATUS             current
    DESCRIPTION
        "The list of Port_IDs which have been assigned in
        this Area and Fabric, formatted as an array of
        octets in ascending order. There could be zero or more
        Port_IDs assigned on this Area and Fabric.
```

Each octet represents one Port\_ID. So, the list containing the Port\_IDs 23, 45, 235 and 56 would be formatted as the 4-octet string x'172d38eb'."

```
 ::= { t11FamAreaEntry 2 }
```

```
--
-- t11FamDatabaseTable
-- .
```

t11FamDatabaseTable OBJECT-TYPE  
SYNTAX SEQUENCE OF T11FamDatabaseEntry  
MAX-ACCESS not-accessible  
STATUS current

Expires May 2006

[Page 28]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

DESCRIPTION

"This table contains all information known by the a switch about all the domains which have been assigned in each Fabric."

REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3), ANSI INCITS 384-2004, [section 4.8](#)."

::= { t11FamInfo 2 }

t11FamDatabaseEntry OBJECT-TYPE  
SYNTAX T11FamDatabaseEntry  
MAX-ACCESS not-accessible  
STATUS current

DESCRIPTION

"An entry (conceptual row) in the t11FamDatabaseTable containing information about one Domain\_ID in the Fabric identified by t11FamFabricIndex, and known by the switch identified by t11FamFabricIndex and t11FamDatabaseDomainId."

INDEX { fcmInstanceIndex, fcmSwitchIndex,  
t11FamFabricIndex , t11FamDatabaseDomainId}

::= { t11FamDatabaseTable 1 }

T11FamDatabaseEntry ::= SEQUENCE {  
t11FamDatabaseDomainId FcDomainIdOrZero,  
t11FamDatabaseSwitchWwn FcNameIdOrZero  
}

t11FamDatabaseDomainId OBJECT-TYPE  
SYNTAX FcDomainIdOrZero (1..239)  
MAX-ACCESS not-accessible  
STATUS current

DESCRIPTION

"The Domain\_ID for which this row contains information. The value must be non-zero."

::= { t11FamDatabaseEntry 1 }



```
t11FamDatabaseSwitchWwn OBJECT-TYPE
    SYNTAX      FcNameIdOrZero
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The Node name (WWN) of the switch to which the
        corresponding value of t11FamDatabaseDomainId is currently
        assigned for the particular Fabric."
    ::= { t11FamDatabaseEntry 2 }
```

Expires May 2006

[Page 29]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

```
--
-- Fibre Channel Address Identifier cache information
--
-- The cached information allows the Fabric Address Manager to
-- implement the concept of a Preferred Domain_ID, whereby after a port
-- releases a Fibre Channel Address Identifier value, a switch makes an
-- attempt to re-assign the same Fibre Channel Address Identifier value
-- on the next occasion when that port requests an assignment.
--
```

```
t11FamMaxFcIdCacheSize OBJECT-TYPE
    SYNTAX      Unsigned32 (0..4294967295)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The maximum number of Fibre Channel Address Identifiers
        that are able to be cached in the t11FamFcIdCacheTable.
        If the number is unknown, the value of this object is
        zero."
    ::= { t11FamInfo 3 }
```

```
--
-- t11FamFcIdCacheTable
--
```

```
t11FamFcIdCacheTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF T11FamFcIdCacheEntry
    MAX-ACCESS  not-accessible
    STATUS      current
```

## DESCRIPTION

"This table contains all the Fibre Channel Address Identifiers that have recently been released by the Fabric Address Manager in a switch . So, it lists all the Fibre Channel Address Identifiers that have valid WWN-to-Fibre Channel Address Identifier mappings and are currently not assigned to any ports. These Fibre Channel Address Identifier were assigned to ports but have since been released. These cached Fibre Channel Address Identifiers contain only Area\_ID and Port\_ID information. This cache is kept to provide best effort re-assignment of same Fibre Channel Address Identifiers, i.e., when an Nx\_Port asks for an Fibre Channel Address Identifier, soon after releasing one, the same value is re-assigned, if possible."

::= { t11FamInfo 4 }

Expires May 2006

[Page 30]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

### t11FamFcIdCacheEntry OBJECT-TYPE

SYNTAX T11FamFcIdCacheEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"An entry (conceptual row) in the t11FamFcIdCacheTable containing information about one Fibre Channel Address Identifier that was released from a WWN, corresponding to a range of one or more ports connected to the switch (identified by t11FamFabricIndex and t11FamFcIdCacheWwn) in the Fabric (identified by t11FamFabricIndex). An entry is created when a Fibre Channel Address Identifier is released by the last port in the range. The oldest entry is deleted if the number of rows in this table reaches t11FamMaxFcIdCacheSize, and its space is required for a new entry. An entry is also deleted when its Fibre Channel Address Identifier is assigned to a port."

INDEX { fcmInstanceIndex, fcmSwitchIndex,  
t11FamFabricIndex, t11FamFcIdCacheWwn }

::= { t11FamFcIdCacheTable 1 }

T11FamFcIdCacheEntry ::= SEQUENCE {

t11FamFcIdCacheWwn

FcNameIdOrZero,

```
t11FamFcIdCacheAreaIdPortId      OCTET STRING,  
t11FamFcIdCachePortIds           Unsigned32  
}
```

```
t11FamFcIdCacheWwn  OBJECT-TYPE  
SYNTAX      FcNameIdOrZero  
MAX-ACCESS  not-accessible  
STATUS      current  
DESCRIPTION  
    "The N_Port_Name (WWN) of the port associated this entry."  
 ::= { t11FamFcIdCacheEntry 1 }
```

```
t11FamFcIdCacheAreaIdPortId  OBJECT-TYPE  
SYNTAX      OCTET STRING (SIZE (2))  
MAX-ACCESS  read-only  
STATUS      current  
DESCRIPTION  
    "The Area_ID and Port_ID of the first Fibre Channel Address  
    Identifier in a range, that was assigned and has since been  
    released on this Fabric.
```

Note that this object is only 2 bytes and only

```
    contains the Area_ID and Port_ID."  
 ::= { t11FamFcIdCacheEntry 2 }
```

```
t11FamFcIdCachePortIds  OBJECT-TYPE  
SYNTAX      Unsigned32 (0..65535)  
MAX-ACCESS  read-only  
STATUS      current  
DESCRIPTION  
    "The number of Port_IDs in the range all of which were  
    assigned and later released.  The range starts with the  
    Port_ID contained in the second byte of  
    t11FamFcIdCacheAreaIdPortId for the Area_ID contained in the  
    first byte of object t11FamFcIdCacheAreaIdPortId."  
 ::= { t11FamFcIdCacheEntry 3 }
```

-- Objects for use in notifications

t11FamNotifyFabricIndex OBJECT-TYPE

SYNTAX T11FabricIndex

MAX-ACCESS accessible-for-notify

STATUS current

DESCRIPTION

"A unique index value which identifies a particular Fabric for which a particular notification is generated.

In a Fabric conformant to SW-3, only a single Fabric can operate within a physical infrastructure, and thus, the value of this Fabric Index will always be 1.

However, forthcoming standards (e.g., FC-SW-4), will likely define how multiple Fabrics, each with its own management instrumentation, could operate within one (or more) physical infrastructures. To allow for such multiple fabrics, this index value is used to uniquely identify a particular Fabric within a physical infrastructure."

::= { t11FamNotifyControl 1 }

-- Notifications

t11FamDomainIdNotAssignedNotify NOTIFICATION-TYPE

OBJECTS { t11FamLocalSwitchWwn, t11FamNotifyFabricIndex }

STATUS current

DESCRIPTION

"This notification indicates that a Domain\_ID has not

Expires May 2006

[Page 32]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

been not configured nor assigned for a particular Fabric, identified by t11FamNotifyFabricIndex, on a particular switch identified by t11FamLocalSwitchWwn. This could happen under the following conditions, and results in the switch isolating E\_Ports on the Fabric:

- if the switch's request for a configured static Domain\_ID is rejected or no other Domain\_ID is assigned, then the E\_Ports are isolated."

::= { t11FamNotifications 1 }

```
t11FamNewPrincipalSwitchNotify NOTIFICATION-TYPE
  OBJECTS      { t11FamLocalSwitchWwn, t11FamNotifyFabricIndex }
  STATUS       current
  DESCRIPTION
    "This notification indicates that a particular switch,
    identified by t11FamLocalSwitchWwn, has become the new
    Principal Switch on the Fabric identified by
    t11FamNotifyFabricIndex.

    This notification is sent soon after its election as
    the new Principal Switch, i.e., upon expiration of a
    Principal Switch selection timer which is equal to
    twice the Fabric Stability Timeout value (F_S_TOV)."
  ::= { t11FamNotifications 2 }
```

```
t11FamFabricChangeNotify NOTIFICATION-TYPE
  OBJECTS      { t11FamLocalSwitchWwn, t11FamNotifyFabricIndex }
  STATUS       current
  DESCRIPTION
    "This notification is sent whenever a particular switch,
    identified by t11FamLocalSwitchWwn, sends or
    receives a Build Fabric (BF) or a ReConfigure Fabric
    (RCF) message on the Fabric identified by
    t11FamNotifyFabricIndex.

    This notification is not sent if a
    't11FamNewPrincipalSwitchNotify' notification is sent
    for the same event."
  ::= { t11FamNotifications 3 }
```

```
--
-- Conformance
--
```

Expires May 2006

[Page 33]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

```
t11FamMIBCompliances OBJECT IDENTIFIER ::= { t11FamMIBConformance 1 }
t11FamMIBGroups OBJECT IDENTIFIER ::= { t11FamMIBConformance 2 }
```

```
t11FamMIBCompliance MODULE-COMPLIANCE
  STATUS current
```

```
DESCRIPTION
    "The compliance statement for Fibre Channel switches
    which implement Fabric Address Manager functionality."
MODULE
MANDATORY-GROUPS { t11FamGroup,
                    t11FamDatabaseGroup,
                    t11FamAreaGroup,
                    t11FamNotificationGroup
                  }

OBJECT t11FamConfigDomainId
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT t11FamConfigDomainIdType
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT t11FamAutoReconfigure
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT t11FamContiguousAllocation
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT t11FamPriority
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT t11FamIfRcfReject
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."
```

OBJECT t11FamIfRowStatus  
MIN-ACCESS read-only  
DESCRIPTION  
    "Write access is not required."

OBJECT t11FamRcFabricNotifyEnable  
MIN-ACCESS read-only  
DESCRIPTION  
    "Write access is not required."

GROUP t11FamCacheGroup  
DESCRIPTION  
    "This group is mandatory only for switches which support the concept of Preferred Domain\_ID via a best effort attempt for (short-term) re-assignment of the same FC address identifiers."

GROUP t11FamCommandGroup  
DESCRIPTION  
    "This group is optional."

::= { t11FamMIBCompliances 1 }

-- Units of Conformance

t11FamGroup OBJECT-GROUP  
    OBJECTS { t11FamConfigDomainId,  
              t11FamConfigDomainIdType,  
              t11FamAutoReconfigure,  
              t11FamContiguousAllocation,  
              t11FamPriority,  
              t11FamPrincipalSwitchWwn,  
              t11FamLocalSwitchWwn,  
              t11FamAssignedAreaIdList,  
              t11FamGrantedFcIds,  
              t11FamRecoveredFcIds,  
              t11FamFreeFcIds,  
              t11FamAssignedFcIds,  
              t11FamAvailableFcIds,  
              t11FamRunningPriority,  
              t11FamPrincSwRunningPriority,  
              t11FamState,  
              t11FamLocalPrincipalSwitchSlctns,  
              t11FamPrincipalSwitchSelections,  
              t11FamBuildFabrics,

---

Internet Draft   Fibre Channel Fabric Address Manager MIB   November 2005

```

        t11FamFabricReconfigures,
        t11FamDomainId,
        t11FamSticky,
        t11FamRestart,
        t11FamRcFabricNotifyEnable,
        t11FamEnable,
        t11FamFabricName,
        t11FamIfRcfReject,
        t11FamIfRole,
        t11FamIfRowStatus,
        t11FamNotifyFabricIndex
    }
STATUS    current
DESCRIPTION
    "A collection of general objects for displaying and
    configuring Fabric Address management."
 ::= { t11FamMIBGroups 1 }

t11FamCommandGroup OBJECT-GROUP
OBJECTS   { t11FamRestart }
STATUS    current
DESCRIPTION
    "A collection of objects used for initiating an
    operation on the Fabric."
 ::= { t11FamMIBGroups 2 }

t11FamDatabaseGroup OBJECT-GROUP
OBJECTS   { t11FamDatabaseSwitchWwn }
STATUS    current
DESCRIPTION
    "A collection of objects containing information about
    Domain-IDs assignments."
 ::= { t11FamMIBGroups 3 }

t11FamAreaGroup OBJECT-GROUP
OBJECTS   { t11FamAreaAssignedPortIdList }
STATUS    current
DESCRIPTION
    "A collection of objects containing information about
    currently assigned addresses within a Domain."
 ::= { t11FamMIBGroups 4 }

t11FamCacheGroup OBJECT-GROUP
```



```
OBJECTS { t11FamMaxFcIdCacheSize,
          t11FamFcIdCacheAreaIdPortId,
```

Expires May 2006

[Page 36]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

```
          t11FamFcIdCachePortIds
        }
STATUS    current
DESCRIPTION
    "A collection of objects containing information about
    recently-released Fibre Channel Address Identifiers."
 ::= { t11FamMIBGroups 5 }

t11FamNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS { t11FamDomainIdNotAssignedNotify,
                t11FamNewPrincipalSwitchNotify,
                t11FamFabricChangeNotify }
STATUS    current
DESCRIPTION
    "A collection of notifications for status monitoring
    and notification."
 ::= { t11FamMIBGroups 6 }
END
```

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

## 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 document began life as a work item of the INCITS Task Group T11.5. We wish to acknowledge the many contributions and comments from the INCITS Technical Committee T11, including the following:

T11 Chair: Robert Snively, Brocade  
T11 Vice Chair: Claudio DeSanti, Cisco Systems  
T11.5 Chair: Roger Cummings, Symantec

T11.5 members, especially:  
Ken Hirata, Emulex  
Scott Kipp, McData  
Michael O'Donnell, McData  
Elizabeth G. Rodriguez, Dot Hill  
Steven L. Wilson, Brocade

Thanks also to Orly Nicklass of RAD Data Communications, Bert Wijnen of Lucent, and those members of the IMSS WG who provided review comments.

Expires May 2006

[Page 38]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

## 9. Normative References

[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.

[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.

[IF-MIB]

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

[FC-MGMT]

K. McCloghrie, "Fibre Channel Management MIB", [RFC 4044](#), May 2005.

[FC-SW-3]

"Fibre Channel - Switch Fabric - 3 (FC-SW-3)", ANSI INCITS 384-2004, June 2004.

[FC-SW-4]

"Fibre Channel - Switch Fabric - 4 (FC-SW-4)", ANSI NCITS xxx-200x, T11/Project 1674-D/Rev 7.1, October 2004.

-- RFC-Editor: please read this note and then delete it: the above  
-- reference contains "xxx" because the number has  
-- not yet been assigned by ANSI; until it is, the  
-- T11 project number listed above is the necessary  
-- and sufficient mechanism to locate the document.

[FC-FS]

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

Expires May 2006

[Page 39]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

## [10.](#) Informative References

[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.

[FC-MI]

"Fibre Channel - Methodologies for Interconnects (FC-MI)", T11/Project 1377-DT/Rev 1.92, December 2001.

## [11.](#) IANA Considerations

IANA is requested to make two MIB OID assignments, one for the

T11-TC-MIB module and one for the T11-FC-FABRIC-ADDR-MGR-MIB module, under the appropriate subtree(s).

## 12. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

t11FamConfigDomainId, t11FamConfigDomainIdType and t11FamContiguousAllocation -- ability to change the address allocation policy.

t11FamRestart and t11FamAutoReconfigure -- ability to cause a fabric reconfiguration, e.g., on certain error conditions.

t11FamPriority -- ability to affect which switch becomes the Principal switch.

t11FamRcFabricNotifyEnabl -- ability to enable/disable a notification.

t11FamIfRcfReject -- ability to change the switch's behaviour on receipt of an RCF.

t11FamIfRowStatus -- ability to change an interface configuration parameter.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may also 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. These are the tables and objects and their sensitivity/vulnerability:

t11FamTable and t11FamIfTable -- contain the configuration, status and statistics of the Fabric Address Manager.

t11FamAreaTable, t11FamDatabaseTable and t11FamFcIdCacheTable -- contain information on currently assigned or recently-released addresses.

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.

### 13. Authors' Addresses

Claudio DeSanti  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134 USA  
Phone: +1 408 853-9172

EMail: cds@cisco.com

Vinay Gaonkar  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134 USA  
Phone: +1 408 527-8576  
EMail: vgaonkar@cisco.com

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

Silvano Gai  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA USA 95134  
Phone: +1 408-526-7269  
Email: sgai@cisco.com

#### Full Copyright Statement

Copyright (C) The Internet Society (2005). 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 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 May 2006

[Page 42]

---

Internet Draft Fibre Channel Fabric Address Manager MIB November 2005

Disclaimer of validity

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights 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; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in [BCP 78](#) and [BCP 79](#).

Copies of IPR disclosures made to the IETF Secretariat 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 implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at [ietf-ipr@ietf.org](mailto:ietf-ipr@ietf.org).

#### Acknowledgment

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