Fibre Channel Fabric Address Manager MIB

Status of This Memo

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

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Abstract

This memo defines 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.
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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-Switch Link (ISL), 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 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 that 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 that 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 [FC-SW-3] standard for an interconnecting Fabric consisting of multiple Fabric Switch elements describes the operation of a single Fabric in a physical infrastructure. The current [FC-SW-4] standard also supports the operation of multiple Virtual Fabrics operating within one (or more) physical infrastructures. In such a scenario, each Fabric has, of course, its own management instrumentation. In order to accommodate this scenario, this MIB module defines all Fabric-related information in tables that are INDEXed by an arbitrary integer, named a "Fabric Index". In a Fabric that 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, fcSwitchIndex 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 that 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 that 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.

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:

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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 an 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/cannot ensure the successful operation of the SW_ILS operation.
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 "200603020000Z"
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: kmz@cisco.com"

DESCRIPTION
 "This module defines textual conventions used in T11 MIBs.

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 of this MIB module is part of RFC 4439; see the RFC
 itself for full legal notices."

REVISION    "200603020000Z"
DESCRIPTION
 "Initial version of this MIB module, published as RFC 4439."
 ::= { mib-2 136 }

T11FabricIndex ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS current
DESCRIPTION
 "A Fabric Index that is used as a unique
 index value to identify a particular Fabric within
 one (or more) physical infrastructures.

 In an environment that is conformant to FC-SW-3, where

DeSanti, et al. Standards Track [Page 8]
there is always exactly one Fabric in a single physical infrastructure, the value of this Fabric Index will always be 1.

However, the current 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 textual convention 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), ANSI INCITS 418-2006, 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]
fcInstanceIndex, fcmSwitchIndex,
FcDomainIdOrZero, FcNameIdOrZero FROM FC-MGMT-MIB -- [FC-MGMT]
T11FabricIndex FROM T11-TC-MIB;

t11FcFabricAddrMgrMIB MODULE-IDENTITY
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 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.

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DISPLAY-HINT  "d"
STATUS    current
DESCRIPTION
"Priority of a switch.
The Principal Switch selection is influenced by the priority of the switches.
Some values 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."
SYNTAX    Unsigned32 (1..255)

T11FamDomainInterfaceRole ::= TEXTUAL-CONVENTION
STATUS    current
DESCRIPTION
"The 'designated' state/role of the Inter-Switch Link (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
principalDownsteam (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),
    principalDownsteam (3),
    isolated (4),
    down (5),
    unknown (6)
}

T11FamState ::= TEXTUAL-CONVENTION
STATUS    current
DESCRIPTION
"The state of the Fabric Address Manager, as described in Table 86 and Figure 15 of FC-SW-3.

- ‘other’ represents a switch that 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 that 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 that is in state F0 of Figure 15.
- ‘reconfigureFabricPhase’ represents a switch that is in state F1 of Figure 15.
- ‘stable’ represents a switch that has successfully completed the process represented by the third row in Table 86 and has at least one E_Port.
- ‘stableWithNoEports’ represents a switch that has successfully completed the process represented by the third row in Table 86 but has no E_Ports.
- ‘noDomains’ represents a switch that 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 the value ‘false’.
- ‘unknown’ represents a switch that 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)
}

--

-- t11FamTable
--

```
t11FamTable OBJECT-TYPE
SYNTAX     SEQUENCE OF T11FamEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
 "This table contains Fabric Address Manager related
 parameters that 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 { fcmInstanceIndex, fcmSwitchIndex, t11FamFabricIndex }
 ::= { t11FamTable 1 }
```

```
T11FamEntry ::= SEQUENCE {
    t11FamFabricIndex                T11FabricIndex,
    t11FamConfigDomainId             FcDomainIdOrZero,

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t11FamConfigDomainIdType          INTEGER,  
t11FamAutoReconfigure             TruthValue,  
t11FamContiguousAllocation       TruthValue,  
t11FamPriority                   T11FamDomainPriority,  
t11FamPrincipalSwitchWwn         FcNameIdOrZero,  
t11FamLocalSwitchWwn             FcNameIdOrZero,  
t11FamAssignedAreaIdList         OCTET STRING,  
t11FamGrantedFcIds               Counter32,  
t11FamRecoveredFcIds             Counter32,  
t11FamAssignedFcIds              Gauge32,  
t11FamFreeFcIds                  Gauge32,  
t11FamRunningPriority            T11FamDomainPriority,  
t11FamBuildFabrics               Counter32,  
t11FamFabricReconfigures         Counter32,  
t11FamDomainId                   FcDomainIdOrZero,  
t11FamSticky                      TruthValue,  
t11FamRestart                    INTEGER,  
t11FamRcFabricNotifyEnable       TruthValue,  
t11FamEnable                     TruthValue,  
t11FamFabricName                 FcNameIdOrZero

}  

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[Page 14]
**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 cannot 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 cannot 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 DESCRIPTION clause."

**REFERENCE**  "Fibre Channel - Switch Fabric - 4 (FC-SW-4), ANSI INCITS 418-2006, section 7."
t11FamConfigDomainIdType OBJECT-TYPE
SYNTAX INTEGER {
    preferred(1),
    insistent(2),
    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 DESCRIPTION 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 lists.

If value of this object is ‘true’, the switch will send an 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 DESCRIPTION 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), INCITS TR-30-2002, 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
DESCRIPTION "The WWN of the particular switch on this Fabric."
::= { t11FamEntry 8 }

\textbf{t11FamAssignedAreaIdList} \hspace{1em} \textbf{OBJECT-TYPE}
SYNTAX OCTET STRING (SIZE(0..256))
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The list of (zero or more) Area_IDs that 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 }

\textbf{t11FamGrantedFcIds} \hspace{1em} \textbf{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 that all Counter32s have when sysUpTime=0."
::= { t11FamEntry 10 }

\textbf{t11FamRecoveredFcIds} \hspace{1em} \textbf{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. This counter has no discontinuities other than those that all Counter32s have when sysUpTime=0."

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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.""
DESCRIPTION
"The running priority of a particular switch on this Fabric. This value is initialized 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 }

```
t11FamLocalPrincipalSwitchSelections 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 that all Counter32s have when sysUpTime=0."
::= { t11FamEntry 18 }
```

```
t11FamPrincipalSwitchSelections OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"The number of Principal Switch selections on this Fabric. This counter has no discontinuities other than those that all Counter32s 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 that all Counter32s 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 that all Counter32s 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
"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 }

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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 an 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 }

DeSanti, et al. Standards Track [Page 22]
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), ANSI INCITS 418-2006, 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),
ANSI INCITS 418-2006, 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 that 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 that 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

DeSanti, et al. Standards Track [Page 24]"
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 that 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 }

--

DeSanti, et al.     Standards Track
-- 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 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 }
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
 corresponds value of t11FamDatabaseDomainId is currently
 assigned for the particular Fabric."
::= { t11FamDatabaseEntry 2 }
```

--
-- 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 Identifiers 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 a Fibre Channel Address Identifier, soon after releasing one, the same value is re-assigned, if possible."

::= { t11FamInfo 4 }

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

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DESCRIPTION
"The N_Port_Name (WWN) of the port associated with this entry."
::= { t11FamFcIdCacheEntry 1 }

t11FamFcIdCacheAreaIdPortId OBJECT-TYPE
SYNTAX OCTET STRING (SIZE (2))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The combination of this object and t11FamFcIdCachePortIds represent one range of Fibre Channel Address Identifiers, which were assigned and later released. This object contains the Area_ID and Port_ID of the first Fibre Channel Address Identifier in the range.

Note that this object is only 2 bytes."
::= { t11FamFcIdCacheEntry 2 }

t11FamFcIdCachePortIds OBJECT-TYPE
SYNTAX Unsigned32 (0..65535)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The combination of t11FamFcIdCacheAreaIdPortId and this object represent one range of Fibre Channel Address Identifiers, which were assigned and later released. This object contains the number of (consecutive) Fibre Channel Address Identifiers in the range."
::= { t11FamFcIdCacheEntry 3 }

-- Objects for use in notifications

t11FamNotifyFabricIndex OBJECT-TYPE
SYNTAX T11FabricIndex
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"A unique index value that 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, the current standard, FC-SW-4, defines how multiple Fabrics, each with its own management
instrumentation, could operate within one (or more) physical infrastructures. In order to accommodate this scenario, 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 been configured or 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 that 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
--
t11FamMIBCompliances OBJECT IDENTIFIER ::= { t11FamMIBConformance 1 }
t11FamMIBGroups OBJECT IDENTIFIER ::= { t11FamMIBConformance 2 }

t11FamMIBCompliance MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION "The compliance statement for Fibre Channel switches that 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 that 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,}
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t11FamAvailableFcIds,
t11FamRunningPriority,
t11FamPrincSwRunningPriority,
t11FamState,
t11FamLocalPrincipalSwitchSlctns,
t11FamPrincipalSwitchSelections,
t11FamBuildFabrics,
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 }

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t11FamCacheGroup OBJECT-GROUP
   OBJECTS  { t11FamMaxFcIdCacheSize,
               t11FamFcIdCacheAreaIdPortId,
               t11FamFcIdCachePortIds
           }
   STATUS  current
   DESCRIPTION
      "A collection of objects containing information about
       recently-released Fibre Channel Address Identifiers."
   ::= { t11FamMIBGroups 5 }

7.  Acknowledgements

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T11 Vice Chair: Claudio DeSanti, Cisco Systems
T11.5 Chair: Roger Cummings, Symantec
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8. Normative References


9. Informative References


10. IANA Considerations

IANA has made 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).

11. 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.
- t11FamRcFabricNotifyEnable -- ability to enable/disable a notification.
- t11FamIfRcfReject -- ability to change the switch’s behavior 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.
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