

Internet Draft

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**Fibre Channel Fabric Address Manager MIB
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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. At present, this memo is a work item of T11.5 (<http://www.t11.org>). The plan is that it will later be a work item of the IETF's IMSS working group.

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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

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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 [[RFC2863](#)] 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

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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 [[RFC2741](#)] 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. It is possible that future standards will define how multiple Fabrics could

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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 future 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.

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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.

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6. Definitions

6.1. T11-TC-MIB

T11-TC-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, Unsigned32 FROM SNMPv2-SMI -- [\[RFC2578\]](#)
TEXTUAL-CONVENTION FROM SNMPv2-TC; -- [\[RFC2579\]](#)

t11TcMIB MODULE-IDENTITY

LAST-UPDATED "200406050000Z"

ORGANIZATION "T11"

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DESCRIPTION

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

REVISION "200406050000Z"

DESCRIPTION

"Initial version of this MIB module."

::= { tbd }

FabricIndex ::= TEXTUAL-CONVENTION

STATUS current

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.

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In environments conformant to other specifications, the value of this Fabric Index can have other values."

SYNTAX Unsigned32

END

6.2. T11-FC-FABRIC-ADDR-MGR-MIB

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	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]
FabricIndex	FROM T11-TC-MIB;	

t11FabricAddrMgrMIB MODULE-IDENTITY

LAST-UPDATED "200407170000Z"

ORGANIZATION "T11"

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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."

REVISION "200407170000Z"

DESCRIPTION

"Initial version of this MIB module."

::= { tbd }

t11FamMIBObjects OBJECT IDENTIFIER ::= { t11FabricAddrMgrMIB 1 }
t11FamMIBConformance OBJECT IDENTIFIER ::= { t11FabricAddrMgrMIB 2 }
t11FamConfiguration OBJECT IDENTIFIER ::= { t11FamMIBObjects 1 }
t11FamInfo OBJECT IDENTIFIER ::= { t11FamMIBObjects 2 }
t11FamNotifyControl OBJECT IDENTIFIER ::= { t11FamMIBObjects 3 }
t11FamNotifications OBJECT IDENTIFIER ::= { t11FamMIBObjects 0 }

-- Textual Conventions

T11FamDomainPriority ::= TEXTUAL-CONVENTION

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](#)."

SYNTAX Unsigned32 (1..255)

T11FamDomainInterfaceRole ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

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"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, June 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.

- 'starting' represents a switch engaged in 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,
- '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

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- 'noDomains' represents a switch which has completed the process represented by the third row in Table 86 but failed to obtain a Domain_ID
- 'unconfigured' represents a switch which requires operator input before it can begin the process represented by the first 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.
- 'unknown' represents a switch which is confused about what state it is in.
- 'other' represents a switch which is in a state not represented by any of the above enumerations."

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),
 unknown(11)
}

--
-- t11FamTable
--

t11FamTable OBJECT-TYPE
 SYNTAX SEQUENCE OF T11FamEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

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"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 an entry for each Fabric known to such a 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	FabricIndex,
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,
t11FamPrincipalSwitchSelections	Counter32,
t11FamBuildFabrics	Counter32,
t11FamFabricReconfigures	Counter32,
t11FamDomainId	FcDomainIdOrZero,
t11FamLocalPrincipalSwitchSlctns	Counter32,
t11FamSticky	TruthValue,

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```
t11FamRestart                INTEGER,
t11FamRcFabricNotifyEnable   TruthValue
}
```

t11FamFabricIndex OBJECT-TYPE

SYNTAX FabricIndex

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 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, it is possible that future standards will define how multiple Fabrics, each with its own management instrumentation, could operate within one (or more) physical infrastructures. To allow for this future possibility, 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 Domain_ID configured is called 'preferred Domain_ID'. The valid values are between 0 and 239. In a situation where this domain could not be assigned, any other Domain_ID would be acceptable. The value '0' means any Domain_ID.

If t11FamConfigDomainIdType is 'static', then Domain_ID is called 'static Domain_ID' and valid values are between 1 and 239. In a situation where this domain was non-zero but could not be assigned, no other Domain_ID would be acceptable.

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The switch sends an RDI (Request Domain_ID) to request this Domain_ID. If a Domain_ID is not able to be granted in the case of 'preferred', or if a 'static' 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."

DEFVAL { 0 }
::= { t11FamEntry 2 }

t11FamConfigDomainIdType OBJECT-TYPE

SYNTAX INTEGER {
static (1),
preferred(2)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Type of configured Domain_ID."
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."

REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3),
December 2003, sections [6.1.12](#) & 7.3.

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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."

::= { 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."

::= { 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

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SYNTAX FcNameIdOrZero

MAX-ACCESS read-only

STATUS current

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."

::= { 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."

::= { t11FamEntry 11 }

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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."

REFERENCE

"Fibre Channel - Framing and Signaling (FC-FS),
ANSI INCITS 373-2003, [section 15.6.2.4.2](#), April 2003."

::= { t11FamEntry 14 }

t11FamRunningPriority OBJECT-TYPE

SYNTAX T11FamDomainPriority

MAX-ACCESS read-only

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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."
 ::= { t11FamEntry 18 }

t11FamPrincipalSwitchSelections OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of principal switch selections on this Fabric."
 ::= { t11FamEntry 19 }

t11FamBuildFabrics OBJECT-TYPE

SYNTAX Counter32

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MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of non-disruptive fabric reconfigurations (BFs)
 that have occurred on this Fabric."
 ::= { 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."
 ::= { 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 }

t11FamRestart OBJECT-TYPE

SYNTAX INTEGER {
 nonDisruptive(1),
 disruptive(2),

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```
        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'."
REFERENCE "Fibre Channel - Switch Fabric - 3 (FC-SW-3),
    ANSI INCITS 384-2004, June 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
    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."
DEFVAL { false }
 ::= { t11FamEntry 25 }
```

```
--
-- t11FamIfTable - Interface configuration
--
```


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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,

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```
    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."
    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
```

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"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, June 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."

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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

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, June 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

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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 }

--

-- 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 (1..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

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"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 }
```

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

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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 FabricIndex
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.

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However, it is possible that future standards will define how multiple Fabrics, each with its own management instrumentation, could operate within a single physical infrastructure. To allow for this future possibility, this value uniquely identifies the Fabric within the physical infrastructure for which a notification is generated."

::= { t11FamNotifyControl 2 }

-- Notifications

t11FamDomainIdNotAssignedNotify NOTIFICATION-TYPE

OBJECTS { t11FamLocalSwitchWwn, t11FamNotifyFabricIndex }

STATUS current

DESCRIPTION

"This notification indicates that a Domain_ID has not 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

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"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 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."

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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,

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```
t11FamPriority,  
t11FamPrincipalSwitchWwn,  
t11FamLocalSwitchWwn,  
t11FamAssignedAreaIdList,  
t11FamGrantedFcIds,  
t11FamRecoveredFcIds,  
t11FamFreeFcIds,  
t11FamAssignedFcIds,  
t11FamAvailableFcIds,  
t11FamRunningPriority,  
t11FamPrincSwRunningPriority,  
t11FamState,  
t11FamPrincipalSwitchSelections,  
t11FamBuildFabrics,  
t11FamFabricReconfigures,  
t11FamDomainId,  
t11FamLocalPrincipalSwitchSlctns,  
t11FamIfRcfReject,  
t11FamIfRole,  
t11FamIfRowStatus,  
t11FamRcFabricNotifyEnable,  
t11FamNotifyFabricIndex,  
t11FamSticky  
}
```

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 }

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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,
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

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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.

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8. Acknowledgements

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- T11 Chair: Robert Snively, Brocade
- T11 Vice Chair: Claudio Desanti, Cisco Systems
- T11.5 Chair: Roger Cummings, VERITAS
- T11.5 members, especially:
 - Ken Hirata, Emulex
 - Scott Kipp, McData
 - Michael O'Donnell, McData
 - Elizabeth G. Rodriguez, Dot Hill
 - Steven L. Wilson, Brocade

9. Normative References

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[RFC2579]

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[IF-MIB]

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[FC-MGMT]

K. McCloghrie, "Fibre Channel Management MIB", Internet-Draft ([draft-ietf-ips-fcmgmt-mib-nn.txt](#)), work-in-progress.

[FC-SW-3]

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

[FC-FS]

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

[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.

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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.

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.

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Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

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

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

[12.](#) Authors' Addresses

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