Network Working Group
Request for Comments: 4747
Category: Standards Track

S. Kipp
G. Ramkumar
McDATA Corporation
K. McCloghrie
Cisco Systems
November 2006

The Virtual Fabrics MIB

Status of This Memo

Copyright Notice

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 the Fibre Channel network's Virtual Fabrics function.

Table of Contents

1. Introduction 2
2. The Internet-Standard Management Framework 2
3. Short Overview of Fibre Channel 2
4. Relationship to Other MIBs 3
5. MIB Overview 3
   5.1. Fibre Channel Management Instance 4
   5.2. Representing Core and Virtual Switches 4
6. The T11-FC-VIRTUAL-FABRIC-MIB Module 5
7. Security Considerations 16
8. IANA Considerations 17
9. Acknowledgements 17
10. Normative References 17
11. Informative References 18

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 the Fibre Channel network's Virtual Fabric function.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

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 that 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 dynamic and are 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.

Virtual Fabrics allow a single physical Fabric to be divided into multiple logical Fabrics. Each Virtual Fabric may be managed independently like traditional Fabrics. Virtual Fabrics are designed to achieve a better utilization of a physical infrastructure and to isolate events in one Virtual Fabric from affecting other Fabrics. When one Core Switch provides switching functions for multiple Virtual Fabrics, that Core Switch is modeled as containing multiple Virtual Switches, one for each Virtual Fabric.

Each Virtual Fabric is identified by a 12-bit Virtual Fabric ID (VF_ID). When frames from multiple Virtual Fabrics are transmitted over a physical link, the VF_ID carried in a frame's Virtual Fabric Tagging Header (VFT_Header) identifies which Virtual Fabric the frame belongs to. The use of VFT_Headers is enabled through an initial negotiation exchange between the two connected ports.

4. Relationship to Other MIBs

This MIB extends beyond [RFC4044] to cover the functionality, in Fibre Channel switches, of providing Fibre Channel's Virtual Fabrics function.

5. MIB Overview

This MIB module provides the means for monitoring the operation of, and configuring some parameters of, one or more instances of Fibre Channel Virtual Fabric functionality. (Note that there are no definitions in this MIB module of "managed actions" which can be invoked via a remote network management protocol such as SNMP.)

The following MIB module has IMPORTS from [RFC2578], [RFC2579], [RFC2580], [RFC2863], [RFC4044], and [RFC4439]. In REFERENCE clauses, it refers to [FC-SW-4].

5.1. Fibre Channel Management Instance

A Fibre Channel management instance is defined in [RFC4044] 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 [RFC4044] as the index value to uniquely identify each Fibre Channel management instance, for example within the same SNMP context ([RFC3411] section 3.3.1). The t11vfVirtualSwitchTable augments the fcmSwitchTable, and the primary index variable of the fcmSwitchTable is fcmInstanceIndex.

5.2. Representing Core and Virtual Switches

In the presence of Virtual Switches, fcmSwitchTable in RFC4044 contains a row for each Virtual Switch. fcmSwitchTable, t11vfCoreSwitchTable, and t11vfVirtualSwitchTable are complementary. The t11vfCoreSwitchTable and t11vfVirtualSwitchTable contain information that helps the management client determine which Switches are Virtual Switches and how each relates to a Core Switch. A Virtual Switch must reside in a single Core Switch, and a Core Switch is defined as a set of entities with the same Core Switch_Name.

RFC 4044 was defined before Virtual Switches were standard and represented only physical Switches, so the RFC 4044 tables were not defined as read-create. With the advent of Virtual Switches, Virtual Switches can now be created by administrators, and read-create tables are required. The StorageType of RFC 4044 tables were not defined, and StorageTypes used in this MIB should also apply to the RFC 4044 tables that this MIB augments.

6. The T11-FC-VIRTUAL-FABRIC-MIB Module

```
   T11-FC-VIRTUAL-FABRIC-MIB DEFINITIONS ::= BEGIN

   IMPORTS
       MODULE-IDENTITY, OBJECT-TYPE,
       Unsigned32, mib-2
                               FROM SNMPv2-SMI         -- [RFC2578]
       MODULE-COMPLIANCE, OBJECT-GROUP
                               FROM SNMPv2-CONF        -- [RFC2580]
       RowStatus, StorageType  FROM SNMPv2-TC          -- [RFC2579]
       InterfaceIndex          FROM IF-MIB             -- [RFC2863]
       fcmInstanceIndex, FcNameIdOrZero,
       fcmPortEntry, fcmSwitchEntry
                               FROM FC-MGMT-MIB        -- [RFC4044]
       T11FabricIndex          FROM T11-TC-MIB;        -- [RFC4439]

   t11FcVirtualFabricMIB  MODULE-IDENTITY
       LAST-UPDATED    "200611100000Z"
       ORGANIZATION    "IETF IMSS (Internet and Management Support
                        for Storage) Working Group"
       CONTACT-INFO
               "
                        Scott Kipp
                        McDATA Corporation
                     Tel: +1 720 558-3452
                  E-mail: scott.kipp@mcdata.com
                  Postal: 4 McDATA Parkway
                        Broomfield, CO USA 80021

                        G D Ramkumar
                        SnapTell, Inc.
                     Tel: +1 650-326-7627
                  E-mail: gramkumar@stanfordalumni.org
                  Postal: 2741 Middlefield Rd, Suite 200
                        Palo Alto, CA USA 94306

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

       DESCRIPTION
           "This module defines management information specific to
            Fibre Channel Virtual Fabrics.  A Virtual Fabric is a
```

```
            Fabric composed of partitions of switches, links and
            N_Ports with a single Fabric management domain, Fabric
            Services and independence from other Virtual Fabrics.

            Copyright (C) The IETF Trust (2006).  This version of
            this MIB module is part of RFC 4747; see the RFC itself for
            full legal notices."
        REVISION        "200611100000Z"
        DESCRIPTION
            "Initial version of this MIB module, published as RFC 4747."
        ::= { mib-2 147 }

    t11vfObjects       OBJECT IDENTIFIER ::= { t11FcVirtualFabricMIB 1 }
    t11vfConformance   OBJECT IDENTIFIER ::= { t11FcVirtualFabricMIB 2 }

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

    t11vfCoreSwitchTable  OBJECT-TYPE
        SYNTAX      SEQUENCE OF T11vfCoreSwitchEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A table of core switches supported by the current
             management entity."
        ::= { t11vfObjects 1 }

    t11vfCoreSwitchEntry OBJECT-TYPE
        SYNTAX      T11vfCoreSwitchEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Each entry represents one core switch."
        INDEX   { fcmInstanceIndex, t11vfCoreSwitchSwitchName }
        ::= { t11vfCoreSwitchTable 1}

    T11vfCoreSwitchEntry ::=
        SEQUENCE {
           t11vfCoreSwitchSwitchName   FcNameIdOrZero,
           t11vfCoreSwitchMaxSupported Unsigned32,
          t11vfCoreSwitchStorageType  StorageType
        }

    t11vfCoreSwitchSwitchName OBJECT-TYPE
        SYNTAX      FcNameIdOrZero (SIZE(8 | 16))
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
            "The Core Switch_Name (WWN) of this Core Switch."
        ::= { t11vfCoreSwitchEntry 1 }

    t11vfCoreSwitchMaxSupported OBJECT-TYPE
        SYNTAX      Unsigned32 (1..4095)
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "In switches that do not support Virtual Fabrics,
             this object has the value of 1.  If Virtual Fabrics
             are supported, this object is the maximum number of
             Virtual Fabrics supported by the Core Switch.  For
             the purpose of this count, the Control VF_ID is
             ignored."
        ::= { t11vfCoreSwitchEntry 2 }

    t11vfCoreSwitchStorageType OBJECT-TYPE
        SYNTAX      StorageType
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The storage type for this conceptual row.
             Conceptual rows having the value 'permanent' need not
             allow write-access to any columnar objects in the row."
        DEFVAL { nonVolatile }
        ::= { t11vfCoreSwitchEntry 3 }

    -- Virtual Switch table

    t11vfVirtualSwitchTable  OBJECT-TYPE
        SYNTAX      SEQUENCE OF T11vfVirtualSwitchEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A table of Virtual Switches.  When one Core Switch
             provides switching functions for multiple Virtual Fabrics,
             that Core Switch is modeled as containing multiple
             Virtual Switches, one for each Virtual Fabric.  This table
             contains one row for every Virtual Switch on every Core
             Switch.  This table augments the basic switch information in
             the fcmSwitchTable Table in the FC-MGMT-MIB."
        REFERENCE
            "fcmSwitchTable is defined in the FC-MGMT-MIB [RFC4044]."
        ::= { t11vfObjects 2 }

    t11vfVirtualSwitchEntry OBJECT-TYPE
        SYNTAX      T11vfVirtualSwitchEntry
```

```
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An entry of the Virtual Switch table.  Each row is for a
             Virtual Switch.

             This table augments the fcmSwitchTable, i.e., every entry
             in this table has a one-to-one correspondence with an
             entry in the fcmSwitchTable.  At the time when the
             fcmSwitchTable was defined, it applied to physical
             switches.  With the definition and usage of virtual
             switches, fcmSwitchTable now applies to virtual switches
             as well as physical switches, and (in contrast to physical
             switches) it is appropriate to provide the capability for
             virtual switches to be created via remote management
             applications, e.g., via SNMP.

             So, this entry contains a RowStatus object (to allow the
             creation of a virtual switch), as well as a StorageType
             object.  Obviously, if a row is created/deleted in this
             table, the corresponding row in the fcmSwitchTable will
             be created/deleted."
        REFERENCE
            "fcmSwitchEntry is defined in the FC-MGMT-MIB module
             [RFC4044]."
        AUGMENTS   { fcmSwitchEntry }
        ::= { t11vfVirtualSwitchTable 1}

    T11vfVirtualSwitchEntry ::=
        SEQUENCE {
            t11vfVirtualSwitchVfId               T11FabricIndex,
            t11vfVirtualSwitchCoreSwitchName     FcNameIdOrZero,
            t11vfVirtualSwitchRowStatus          RowStatus,
            t11vfVirtualSwitchStorageType       StorageType
        }

    t11vfVirtualSwitchVfId OBJECT-TYPE
        SYNTAX      T11FabricIndex
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The VF_ID of the Virtual Fabric for which this virtual
             switch performs its switching function.  The Control
             VF_ID is implicitly enabled and is not set.
             Communication with the Control VF_ID is required."
        REFERENCE
            "FC-SW-4, REV 7.5, section 12.2"
        ::= { t11vfVirtualSwitchEntry 1 }
```

```
   t11vfVirtualSwitchCoreSwitchName OBJECT-TYPE
       SYNTAX      FcNameIdOrZero (SIZE(8 | 16))
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
           "The Core Switch_Name (WWN) of the Core Switch that
            contains this Virtual Switch."
       REFERENCE
           "FC-SW-4, REV 7.5, section 12.2."
       ::= { t11vfVirtualSwitchEntry 2 }

   t11vfVirtualSwitchRowStatus OBJECT-TYPE
           SYNTAX      RowStatus
           MAX-ACCESS  read-create
           STATUS      current
           DESCRIPTION
               "The status of this row."
           ::= { t11vfVirtualSwitchEntry 3 }

   t11vfVirtualSwitchStorageType OBJECT-TYPE
       SYNTAX      StorageType
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "The storage type for this conceptual row.
            Conceptual rows having the value 'permanent' need not
            allow write-access to any columnar objects in the row."
       DEFVAL { nonVolatile }
       ::= { t11vfVirtualSwitchEntry 4 }

   -- Port table

   t11vfPortTable OBJECT-TYPE
       SYNTAX      SEQUENCE OF T11vfPortEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "A table of Port attributes related to Virtual Fabrics."
       ::= { t11vfObjects 3 }

   t11vfPortEntry OBJECT-TYPE
       SYNTAX      T11vfPortEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "Each entry represents a physical Port on a switch.
            Switches that support Virtual Fabrics would add
```

```
            these four additional columns to the fcmPortEntry
            row."
        REFERENCE
            "fcmPortEntry is defined in the FC-MGMT-MIB module."
        AUGMENTS   { fcmPortEntry }
        ::= { t11vfPortTable 1}

    T11vfPortEntry ::=
        SEQUENCE {
            t11vfPortVfId                T11FabricIndex,
            t11vfPortTaggingAdminStatus   INTEGER,
            t11vfPortTaggingOperStatus    INTEGER,
            t11vfPortStorageType        StorageType
        }

    t11vfPortVfId OBJECT-TYPE
        SYNTAX      T11FabricIndex
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The Port VF_ID assigned to this Port.  The Port VF_ID is the
            default Virtual Fabric that is assigned to untagged frames
            arriving at this Port.  The Control VF_ID is implicitly
            enabled and is not set.  Communication with the Control
            VF_ID is required."
        REFERENCE
            "FC-SW-4, REV 7.5, section 12.1"
        DEFVAL    {1}
        ::= { t11vfPortEntry 1 }

    t11vfPortTaggingAdminStatus OBJECT-TYPE
        SYNTAX INTEGER {
            off(1),
            on(2),
            auto(3)
        }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "This object is used to configure the administrative status
            of Virtual Fabric tagging on this Port.

            SET operation   Description
            --------------  ------------------------------------------
            off(1)          To disable Virtual Fabric tagging on this
                            Port.

            on(2)           To enable Virtual Fabric tagging on this
```

```
                          Port if the attached Port doesn't
                          prohibit it.

               auto(3)    To enable Virtual Fabric tagging if the
                          peer requests it."
        REFERENCE
            "FC-SW-4, REV 7.5, section 12.4"
        ::= { t11vfPortEntry 2 }

     t11vfPortTaggingOperStatus OBJECT-TYPE
        SYNTAX INTEGER {
            off(1),
            on(2)
                }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object is used to report the operational status of
             Virtual Fabric tagging on this Port.

             SET operation   Description
             --------------  -----------------------------------------
             off(1)          Virtual Fabric tagging is disabled on this
                             Port.

             on(2)           Virtual Fabric tagging is enabled on this
                             Port."
        REFERENCE
            "FC-SW-4, REV 7.5, section 12.4"
        ::= { t11vfPortEntry 3 }

    t11vfPortStorageType OBJECT-TYPE
        SYNTAX      StorageType
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The storage type for this conceptual row, and for the
             corresponding row in the augmented fcmPortTable.

             Conceptual rows having the value 'permanent' need not
             allow write-access to any columnar objects in the row."
        DEFVAL { nonVolatile }
        ::= { t11vfPortEntry 4 }


    -- Locally Enabled Table

    t11vfLocallyEnabledTable OBJECT-TYPE
```

```
        SYNTAX      SEQUENCE OF T11vfLocallyEnabledEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A table for assigning and reporting operational status of
             locally-enabled Virtual Fabric IDs to Ports.  The set of
             Virtual Fabrics operational on the Port is the bit-wise
             'AND' of the set of locally-enabled VF_IDs of this Port
             and the locally-enabled VF_IDs of the attached Port."
        ::= { t11vfObjects 4 }

    t11vfLocallyEnabledEntry OBJECT-TYPE
        SYNTAX      T11vfLocallyEnabledEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An entry for each locally-enabled VF_ID on
             each Port."
        REFERENCE
            "FC-SW-4, REV 7.5, section 12.4"
        INDEX { t11vfLocallyEnabledPortIfIndex, t11vfLocallyEnabledVfId }

        ::= { t11vfLocallyEnabledTable 1}

    T11vfLocallyEnabledEntry ::=
        SEQUENCE {
            t11vfLocallyEnabledPortIfIndex    InterfaceIndex,
            t11vfLocallyEnabledVfId           T11FabricIndex,
            t11vfLocallyEnabledOperStatus     INTEGER,
            t11vfLocallyEnabledRowStatus      RowStatus,
            t11vfLocallyEnabledStorageType    StorageType
        }

    t11vfLocallyEnabledPortIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndex
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "The value of the ifIndex that identifies the Port."
        ::= { t11vfLocallyEnabledEntry 1 }

    t11vfLocallyEnabledVfId OBJECT-TYPE
        SYNTAX      T11FabricIndex
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A locally-enabled VF_ID on this Port."
        ::= { t11vfLocallyEnabledEntry 2 }
```

```
   t11vfLocallyEnabledOperStatus OBJECT-TYPE
       SYNTAX INTEGER {
           off(1),
           on(2)
               }
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
           "This object is used to report the operational status of
            Virtual Fabric tagging on this Port.

            SET operation   Description
            --------------  -----------------------------------------
            off(1)          Virtual Fabric tagging is disabled on this
                            Port.

            on(2)           Virtual Fabric tagging is enabled on this
                            Port."
       REFERENCE
           "FC-SW-4, REV 7.3, section 12.4"
       ::= { t11vfLocallyEnabledEntry 3 }

   t11vfLocallyEnabledRowStatus OBJECT-TYPE
           SYNTAX      RowStatus
           MAX-ACCESS  read-create
           STATUS      current
           DESCRIPTION
               "The status of this conceptual row.

                When a row in this table is in 'active(1)' state,
                no object in that row can be modified except
                t11vfLocallyEnabledRowStatus and
                t11vfLocallyEnabledStorageType."
           ::= { t11vfLocallyEnabledEntry 4 }

   t11vfLocallyEnabledStorageType OBJECT-TYPE
           SYNTAX      StorageType
           MAX-ACCESS  read-create
           STATUS      current
           DESCRIPTION
               "The storage type for this conceptual row.
                Conceptual rows having the value 'permanent' need not
                allow write-access to any columnar objects in the row."
           DEFVAL { nonVolatile }
           ::= { t11vfLocallyEnabledEntry 5 }

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

```
   -- Conformance Section
   --

   t11vfMIBCompliances OBJECT IDENTIFIER ::= { t11vfConformance 1 }
   t11vfMIBGroups      OBJECT IDENTIFIER ::= { t11vfConformance 2 }

   t11vfMIBCompliance MODULE-COMPLIANCE
       STATUS  current
       DESCRIPTION
           "Describes the requirements for compliance to the
            Fibre Channel Virtual Fabric MIB."
       MODULE  -- this module
           MANDATORY-GROUPS { t11vfGeneralGroup }

           OBJECT t11vfCoreSwitchMaxSupported
           MIN-ACCESS read-only
           DESCRIPTION
               "Write access is not required."

           OBJECT t11vfCoreSwitchStorageType
           MIN-ACCESS read-only
           DESCRIPTION
               "Write access is not required."

           OBJECT t11vfVirtualSwitchVfId
           MIN-ACCESS read-only
           DESCRIPTION
               "Write access is not required."

           OBJECT t11vfVirtualSwitchRowStatus
           SYNTAX RowStatus { active(1) }
           MIN-ACCESS read-only
           DESCRIPTION
               "Write access is not required."

           OBJECT t11vfVirtualSwitchStorageType
           MIN-ACCESS read-only
           DESCRIPTION
               "Write access is not required."

           OBJECT t11vfPortVfId
           MIN-ACCESS read-only
           DESCRIPTION
               "Write access is not required."

           OBJECT t11vfPortTaggingAdminStatus
           MIN-ACCESS read-only
           DESCRIPTION
```

```
            "Write access is not required."

        OBJECT t11vfPortStorageType
        MIN-ACCESS read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT t11vfLocallyEnabledRowStatus
        SYNTAX       RowStatus { active(1) }
        MIN-ACCESS read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT t11vfLocallyEnabledStorageType
        MIN-ACCESS read-only
        DESCRIPTION
            "Write access is not required."

    ::= { t11vfMIBCompliances 1 }

-- Units of conformance

    t11vfGeneralGroup  OBJECT-GROUP
        OBJECTS { t11vfCoreSwitchMaxSupported,
                  t11vfVirtualSwitchVfId,
                  t11vfVirtualSwitchCoreSwitchName,
                  t11vfVirtualSwitchRowStatus,
                  t11vfPortVfId,
                  t11vfPortTaggingAdminStatus,
                  t11vfLocallyEnabledOperStatus,
                  t11vfPortTaggingOperStatus,
                  t11vfLocallyEnabledRowStatus,
                t11vfCoreSwitchStorageType,
                    t11vfVirtualSwitchStorageType,
                  t11vfPortStorageType,
                  t11vfLocallyEnabledStorageType

        }
        STATUS current
        DESCRIPTION
            "A collection of objects for monitoring and
             configuring Virtual Fabrics in a Fibre Channel switch."
        ::= { t11vfMIBGroups 1 }

END
```

7. 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:

t11vfCoreSwitchMaxSupported, t11vfVirtualSwitchVfId, t11vfCoreSwitchStorageType, t11vfVirtualSwitchStorageType and t11vfVirtualSwitchRowStatus

- the ability to change the configuration of Virtual Fabrics on a particular switch.

t11vfPortTaggingAdminStatus, t11vfLocallyEnabledRowStatus, t11vfPortVfId, t11vfPortStorageType and t11vfLocallyEnabledStorageType

- the ability to change the configuration of Virtual Fabrics on a port of a particular switch.

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

t11vfVirtualSwitchCoreSwitchName, t11vfPortTaggingOperStatus, t11vfLocallyEnabledOperStatus,

- the ability to discover configuration of Virtual Fabrics on a virtual switch or a port.

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 implementers 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.

8. IANA Considerations

IANA has assigned 147 for the MIB module under the appropriate subtree.

9. Acknowledgements

This document was developed by the INCITS Task Group T11.5. We wish to acknowledge the contributions and comments from the INCITS Technical Committee T11 and the IMSS WG, including the following:

T11 Chair: Robert Snively, Brocade
T11 Vice Chair: Claudio Desanti, Cisco Systems
T11.5 Chair: Roger Cummings, Symantec
IMSS WG Chair: David Black, EMC Corporation
Bert Wijnen, Lucent

10. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", RFC 2578, April 1999.

[RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Conformance Statements for SMIv2", RFC 2580, April 1999.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.

[RFC4044] McCloghrie, K., "Fibre Channel Management MIB", RFC 4044, May 2005.

[RFC4439] DeSanti, C., Gaonkar, V., McCloghrie, K., and S. Gai, "Fibre Channel Fabric Address Manager MIB", RFC 4439, March 2006.

[FC-FS] "Fibre Channel Framing and Signaling - 2 (FC-FS-2)", ANSI INCITS 1619-D, http://www.t11.org/t11/stat.nsf/upnum/1619-d, 2006.

[FC-SW-4] "Fibre Channel Switch Fabric 4 (FC-SW-4)", ANSI INCITS 418-2006, http://www.t11.org/t11/stat.nsf/upnum/1674-d, 2006.

11. Informative References

[RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.

[RFC2741] Daniele, M., Wijnen, B., Ellison, M., and D. Francisco, "Agent Extensibility (AgentX) Protocol Version 1", RFC 2741, January 2000.

[RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, RFC 3411, December 2002.

Authors' Addresses

Scott Kipp
McDATA Corporation
4 McDATA Parkway
Broomfield, CO 80021

Phone: +1 720-558-3452
EMail: scott.kipp@mcdata.com

G D Ramkumar
SnapTell, Inc.
2741 Middlefield Rd, Suite 200
Palo Alto, CA 94306

Phone: +1 650-326-7627
EMail: gramkumar@stanfordalumni.org

Keith McCloghrie
Cisco Systems
170 West Tasman Drive
San Jose, CA USA 95134

Phone: +1 408-526-5260
EMail: kzm@cisco.com

Full Copyright Statement

Intellectual Property

Acknowledgement

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