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Fibre Channel Zone Server MIB

Status of This Memo

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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 Zone Server.

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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 Zone Server.

This memo was previously approved by INternational Committee for Information Technology Standards (INCITS) Task Group T11.5 (http://www.t11.org); this document is a product of the IETF's IMSS working group.

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 BCP 14, 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. Overview of Fibre Channel

3.1. General Overview

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. For an Nx_Port, its WWN is called a N_Port_Name and its address identifier is called an N_Port_ID. 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.

3.2. Zoning

Zones within a Fabric provide a mechanism to control frame delivery between Nx_Ports ("Hard Zoning") or to expose selected views of Name Server information ("Soft Zoning").

Communication is only possible when the communicating endpoints are members of a common zone. This technique is similar to virtual private networks in that the Fabric has the ability to group devices into Zones.

Hard zoning and soft zoning are two different means of realizing this. Hard zoning is enforced in the Fabric (i.e., switches) whereas soft zoning is enforced at the endpoints (e.g., host bus adapters (HBAs)) by relying on the endpoints to not send traffic to an N_Port_ID not obtained from the Name Server with a few exceptions for well-known N_Port_IDs used to bootstrap the Fabric (e.g., talk to the Name Server).

Administrators create Zones to increase network security and to prevent data loss or corruption by controlling access between devices or user groups. Zones may be specifically used to create:

a) Barriers between devices that use different operating systems. It is often critical to separate servers and storage devices with different operating systems because accidental transfer of information from one to another may delete or corrupt data;

b) Logical subsets of closed user groups. Administrators may authorize access rights to specific Zones for specific user groups, thereby protecting confidential data from unauthorized access;

c) Groups of devices that are separate from devices in the rest of a Fabric. Zones allow certain processes to be performed on devices in a group without interrupting devices in other groups; or

d) Temporary access between devices for specific purposes. Administrators may remove Zone restrictions temporarily, then restore Zone restrictions to perform normal processes.

3.3. Zoning Configuration and Management

Zones are configured via a Fabric Zone Server, using requests defined in [FC-GS-5]), or via the T11-FC-ZONE-SERVER-MIB module defined in this memo, or via some other mechanism.

An Nx_Port may be a member of one or more Zones. Zone membership may be specified by:

a) The N_Port_Name of the Nx_Port connected to the switch;
b) The N_Port_ID assigned during Fabric Login;
c) The Node_Name associated with the Nx_Port; note that the Node_Name may include more than one Nx_Port;
d) The F_Port_Name of the Fx_Port to which the Nx_Port is connected; or
e) The domain identifier (Domain_ID) and physical port number of the Switch Port to which the Nx_Port is attached.

A Fabric’s Zone Server may be used to create a Zone by specifying the Zone Members. One or more Zones may be collected into a Zone Set, and a Zone may be a member of more than one Zone Set. A Zone Set creates a collection of Zones that may be activated or deactivated as a single entity across all Switches in a Fabric (e.g., having two Zone Sets, one for normal operation, and a second for backup during off-hours). Only one Zone Set may be activated at one time.

Other terminology defined in [FC-GS-5] is: an Active Zone Set is the Zone Set currently enforced by a Fabric; a Zone Set Database is a database of the Zone Sets available to be activated within a Fabric;

and a Zoning Database is a generic term used to indicate a combination of an Active Zone Set and a Zone Set Database.

Two distinct sets of management requests, Enhanced and Basic, are defined in [FC-GS-5] to interact with a Fabric Zone Server. Basic Zoning provides compatibility with [FC-GS-4] and earlier versions of Fibre Channel's Generic Services specification. If all the Switches in a Fabric support the Enhanced request set, then it may be used to manage zoning; otherwise, only the Basic request set may be used, in order to support backward compatibility.

In the context of Enhanced Zoning Management, a management action (i.e., write access to the Zoning Database) to the Zone Server can only occur inside a server session. A server session is set up using the FC-GS-5's Common Transport (CT) protocol defined in [FC-GS-5]. A server session is delimited by CT protocol requests, Server Session Begin (SSB) and Server Session End (SSE), which are directed to the Management Service and which have the GS_Subtype specifying the Zone Server. Query requests that result in read access to the Zoning Database are not required to be issued inside a server session, although the information returned is not guaranteed to be consistent when supplied outside of a server session.

When setting up a server session for Enhanced Zoning, the Zone Server is required to lock the Fabric. This ensures serialized management access to the Zoning Database and guarantees a deterministic behavior. The switch that receives the SSB request is called the 'managing' switch, and it tries to lock the Fabric using the Fabric Management Session Protocol (see section 10.6 of [FC-SW-4]) by sending an Acquire Change Authorization (ACA) request to all other switches in the Fabric. If any switch(es) respond with an SW_RJT indicating failure, then the attempt to lock the Fabric fails and the SSB request is rejected. If all the other switches respond with an SW_ACC indicating success, then the Fabric is locked and the server session can be established. The subsequent SSE request causes a Release Change Authorization (RCA) request to all other switches, and thus, the Fabric to be unlocked.

For at least one application other than Zoning, the managing switch uses a different type of request to lock the Fabric, i.e., it sends an Enhanced Acquire Change Authorization (EACA) request to all other switches in the Fabric. An EACA reserves local resources associated with a designated application to ensure the consistency of that application's data. The application is identified in the EACA using an Application_ID (see Table 116 in [FC-SW-4]). A lock that was established via an EACA is released using an Enhanced Release Change Authorization (ERCA) request.

Changes requested in a Zoning Database by Enhanced Zoning commands persist after the end of the Zoning (server) session only if the commands are followed, within the same server session, by a Commit Zone Changes (CMIT) request. On receipt of a CMIT request, the Zone Server checks that the Zoning Database as modified by the outstanding changes will pass the applicable consistency checks, and then distributes it to all other switches in the Fabric using a Stage Fabric Configuration Update (SFC) request. If all other switches accept the SFC request, then the "managing" switch sends an Update Fabric Configuration (UFC) Request to each other switch, and the staged Zoning Database thereby becomes the Fabric's (active) Zoning Database.

The latest standard for an interconnecting Fabric containing multiple Fabric Switch elements is [FC-SW-4]. [FC-SW-4] carries forward the earlier specification for the operation of a single Fabric in a physical infrastructure, and augments it with the definition of Virtual Fabrics and with the specification of how multiple Virtual Fabrics can operate within one (or more) physical infrastructures. The use of Virtual Fabrics provides for each frame to be tagged in its header to indicate which one of several Virtual Fabrics that frame is being transmitted on. All frames entering a particular "Core Switch" [FC-SW-4] (i.e., a physical switch) on the same Virtual Fabric are processed by the same "Virtual Switch" within that Core switch.

4. Relationship to Other MIBs

The Fibre Channel Management MIB [RFC4044] defines basic information for Fibre Channel hosts and switches, including extensions to the standard IF-MIB [RFC2863] for Fibre Channel interfaces.

This MIB extends beyond [RFC4044] to cover the management of Fibre Channel Zoning Servers, both for Basic Zoning Management and for Enhanced Zoning Management, as defined in the FC-GS-5 specification.

This MIB imports some common Textual Conventions from T11-TC-MIB, defined in [RFC4439]. It also imports a TC from T11-FC-NAME-SERVER-MIB, defined in [RFC4438], plus InetAddressType and InetAddress from INET-ADDRESS-MIB [RFC4001]. It also includes a reference to snmpCommunitySecurityName defined in [RFC3584].

5. MIB Overview

This document defines two MIB modules: T11-FC-FABRIC-LOCK-MIB and T11-FC-ZONE-SERVER-MIB.

T11-FC-FABRIC-LOCK-MIB supports FC-GS-5's generic capability of locking the Fabric for a particular "application" such as (the management of) Enhanced Zoning. The MIB contains one table in which each entry represents a particular switch being the 'managing' switch of a particular application's Fabric lock.

T11-FC-ZONE-SERVER-MIB is specific to the operation of Zone Servers, which can operate in Basic mode or in Enhanced mode. This MIB module imports the T11NsGs4RejectReasonCode textual convention defined in T11-FC-NAME-SERVER-MIB [RFC4438].

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).

5.2. Switch Index

The FC-MGMT-MIB [RFC4044] 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

Whether operating on a physical Fabric (i.e., without Virtual Fabrics) or within a Virtual Fabric, the operation of a Zone Server within a Fabric is identical. Therefore, this MIB defines all Fabric-related information in tables that are INDEXed by an arbitrary

integer, named a "Fabric Index", having the syntax, T11FabricIndex, which is IMPORTed from the T11-TC-MIB [RFC4439]. When a device is connected to a single physical Fabric, without use of any Virtual Fabrics, the value of this Fabric Index will always be 1. In an environment of multiple virtual and/or physical Fabrics, this index provides a means to distinguish one Fabric from another.

It is quite possible, and may even be likely, that a Fibre Channel switch will have ports connected to multiple virtual and/or physical Fabrics. Thus, in order to simplify a management protocol query concerning all the Fabrics to which a single switch is connected, fcmSwitchIndex will be listed before an object with FabricIndex as its syntax when both appear in the same INDEX clause.

5.4. Locking the Fabric

The T11-FC-FABRIC-LOCK-MIB module provides for the management of locks on a Fibre Channel Fabric. A Fibre Channel Fabric lock is used to ensure serialized access to some types of management data related to a Fabric, e.g., the Fabric's Zoning Database.

Some (managing) applications obtain a lock by initiating server sessions and the Fabric is locked so as to reserve local resources in each Switch. For this usage, the managing switch sends an Acquire Change Authorization (ACA) request to other switches in order to lock the Fabric.

For some other applications, a managing switch locks the Fabric using an Enhanced Acquire Change Authorization (EACA) request, which identifies the application on whose behalf the Fabric is being locked with an Application_ID. In this case, only local resources associated with the designated application are reserved.

Locks established via ACAs and via EACAs are both represented in the t11FLockTable in the T11-FC-FABRIC-LOCK-MIB. The Application_ID provided by the EACA serves to distinguish between multiple concurrent locks established by EACAs. In order to use this same mechanism to distinguish a lock established via an ACA from each of those established via EACAs, an additional (special) value of Application_ID has been assigned [APPL-ID] for use by this MIB module. Specifically, this newly assigned value will never be used to indicate an Application locked by an EACA, and therefore this MIB module uses it to uniquely distinguish a lock established via an ACA. In other words, with this additional assignment, an Application_ID value can be used to uniquely identify any active lock amongst all those established (on the same Fabric) either by an EACA or an ACA.

5.5. Basic and Enhanced Modes

The t11ZsServerOperationMode object indicates whether a Fabric's Zone Server is operating in Basic mode or Enhanced mode. These two modes have a sufficient amount of commonality to make it worthwhile to have one set of MIB objects that are used for the subset of functionality that is common to both modes. To accommodate the differences, additional MIB objects are defined.

For Enhanced mode, the additional objects are defined in a group, t11ZsEnhancedModeGroup, which is only required to be implemented in a Zone Server capable of supporting Enhanced mode. The objects specific to Basic mode are always (even in Enhanced mode) expected to be implemented, but when in Enhanced mode, their values are either restricted or do not affect current operations, e.g.,

- an example of "restricted" is: the distribution of updates to the Zone Server database throughout the Fabric has to be requested explicitly in Basic mode; this functionality is provided in the MIB by the t11ZsServerDistribute object. In contrast, in Enhanced mode, the distribution is an implicit part of the commit function which is initiated using the t11ZsServerCommit object. Thus, when operating in Enhanced mode, t11ZsServerDistribute has a fixed value, and when operating in Basic mode, t11ZsServerCommit has a fixed value.

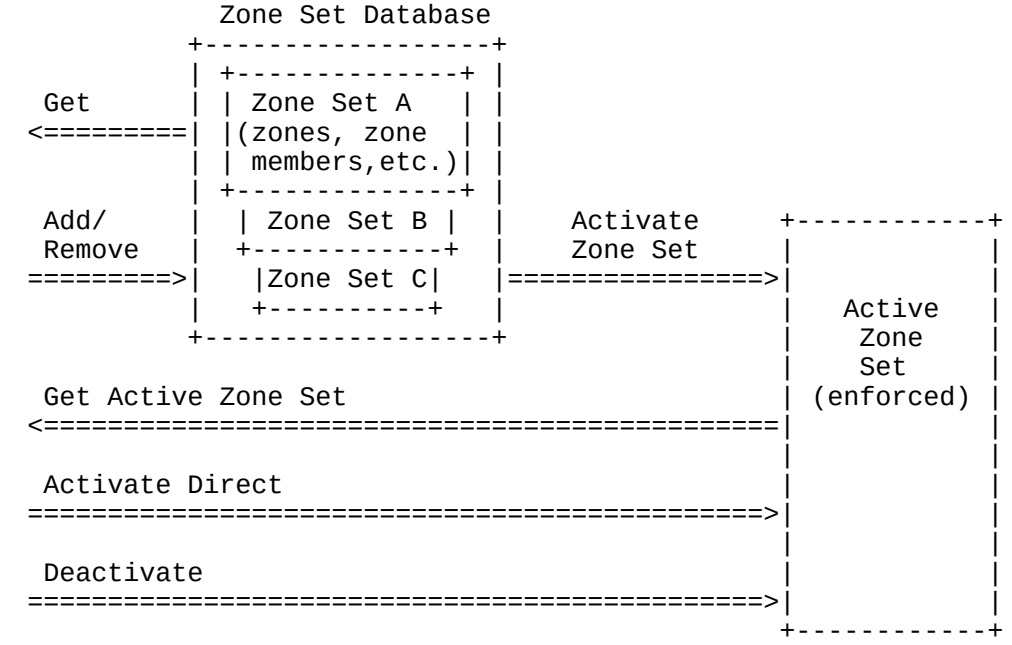
- an example of "do not affect current operations" is: t11ZsServerHardZoning, which specifies whether a switch enforces hard Zoning on a Fabric when in Basic mode. This object is instantiated and could even be modified while in Enhanced mode, but its value only takes effect when in Basic mode. (Note that in Enhanced mode, t11ZsActiveZoneHardZoning specifies whether hard Zoning is enabled on a particular Zone.)

5.6. Persistent Storage

A Zone Server Database for a given Fabric consists of the combination of many of the tables defined in this MIB module. In order to ensure that such a Database is consistent, this MIB module defines just one object (t11ZsServerDatabaseStorageType) with a syntax of StorageType, whose value for a given Fabric is defined to be applicable to all of that Fabric's Zone Server Database as defined in all the tables in this MIB module.

5.7. The Active Zone Set and the Zone Set Database

As described in FC-GS-5 [FC-GS-5], one of the Zone Sets in the Zone Set Database can be activated to become the Active Zone Set, i.e., the one which is enforced on the Fabric. Get/Add/Remove-type requests are defined in FC-GS-5 to allow access to the Zone Set Database. When the Zone Set Database is modified, such modifications don't affect the Active Zone Set unless and until a subsequent activation. Interaction directly with the Active Zone Set is also possible via the FC-GS-5 requests: 'Activate Direct' and 'Get Active Zone Set'. This is illustrated in the following rendition of Figure 15 of [FC-GS-5]:



The T11-FC-ZONE-SERVER-MIB module, defined in section 7, models the above structure by having one set of MIB tables for the Zone Set Database and a separate set for the Active Zone Set, specifically:

- seven tables for the Zone Set Database: t11ZsSetTable, t11ZsZoneTable, t11ZsSetZoneTable, t11ZsAliasTable, t11ZsZoneMemberTable, t11ZsAttribBlockTable and t11ZsAttribTable.

- four tables for the Active Zone Set: t11ZsActiveTable, t11ZsActiveZoneTable, t11ZsActiveZoneMemberTable and t11ZsActiveAttribTable.

5.8. Conformance Groups

5.8.1. The t11ZsBasicGroup

This group contains objects to retrieve and to modify the Zoning configuration of a Zone Server capable of operating in Basic mode.

5.8.2. The t11ZsEnhancedModeGroup

This group contains objects to retrieve and to modify the Zoning configuration of a Zone Server capable of operating in Enhanced mode.

5.8.3. The t11ZsActivateGroup

This group contains objects that allow a Zone Set to be activated via SNMP SetRequests and provide the status and result of such an activation.

5.8.4. The t11ZsStatisticsGroup

This group contains objects for collecting Zone Server statistics.

5.8.5. The t11ZsNotificationGroup

This group contains notifications for monitoring: Zone merge successes and failures, Zone Server request rejections, changes in the Default Zoning behavior, and the success or failure of an attempt to activate or deactivate a Zone Set.

5.8.5.1. Flow-Control for Notifications

When defining SNMP notifications for events that occur in the data-plane, the maximum frequency of their generation needs to be considered. Unless there is some limiting factor, such notifications need to be flow-controlled in some way, e.g., defined such that after some maximum number have occurred within a specified time interval, further notifications are suppressed for some subsequent time interval. However, as and when such a suppression occurs, the Network Management System (NMS) that didn't receive the notifications (because they were suppressed) needs an indication of how many were suppressed. Therefore, an additional Counter32 object needs to be defined, and/or a new type of notification needs to be defined for use at the end of the interval. While this is extra complexity, it is necessary for notifications that need to be flow-controlled.

In contrast, for notifications such as all those defined in this MIB module, which are generated due to control-plane events (and are not able to start a chain reaction):

- estimating the maximum number that could be generated per unit time for each type of notification is too simplistic. For example, it's unreasonable to ask how many of the t11ZsDefZoneChangeNotify notifications can be generated in a time interval because it depends on several factors: how many operators can be re-configuring the network at the same time? and how frequently can each of them change the Default Zone Setting?

- the extra complexity of flow-controlling these types of notifications is not warranted.

5.8.6. The t11ZsNotificationControlGroup

This group contains objects that allow each type of notification (in the t11ZsNotificationGroup group) to be independently enabled or disabled. It also contains objects that are used to include useful information in those notifications; these objects are defined as read-only to allow the values contained in the most recent notification to be queried.

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

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

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE,
    mib-2                               FROM SNMPv2-SMI   -- [RFC2578]
    RowStatus                           FROM SNMPv2-TC    -- [RFC2579]
    MODULE-COMPLIANCE, OBJECT-GROUP     FROM SNMPv2-CONF  -- [RFC2580]
    InetAddressType, InetAddress        FROM
                                        INET-ADDRESS-MIB  -- [RFC4001]
    fcmInstanceIndex, fcmSwitchIndex    FROM FC-MGMT-MIB  -- [RFC4044]
    T11NsGs4RejectReasonCode            FROM
                                T11-FC-NAME-SERVER-MIB  -- [RFC4438]
    T11FabricIndex                      FROM T11-TC-MIB;  -- [RFC4439]

t11FabricLockMIB  MODULE-IDENTITY
    LAST-UPDATED  "200706270000Z"
    ORGANIZATION  "For the initial versions, T11.
                   For later versions, the IETF's IMSS Working Group."
    CONTACT-INFO
           "      Claudio DeSanti
                  Cisco Systems, Inc.
                  170 West Tasman Drive
                  San Jose, CA 95134 USA
                  EMail: cds@cisco.com

                  Keith McCloghrie
```

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                Cisco Systems, Inc.
                170 West Tasman Drive
                San Jose, CA 95134 USA
                EMail: kzm@cisco.com"

    DESCRIPTION
           "The MIB module for the management of locks on a Fibre
           Channel Fabric.  A Fibre Channel Fabric lock is used to
           ensure serialized access to some types of management data
           related to a Fabric, e.g., the Fabric's Zoning Database.

           Some (managing) applications generate Fabric locks by
           initiating server sessions.  Server sessions are
           defined generically in FC-GS-5 to represent a collection of
           one or more requests to the session's server, e.g., to the
           Zone Server.  Such a session is started by a Server Session
           Begin (SSB) request, and terminated by a Server Session End
           (SSE) request.  The switch receiving the SSB is called the
           'managing' switch.  Some applications require the
           'managing' switch to lock the Fabric for the particular
           application, e.g., for Enhanced Zoning, before it can
           respond successfully to the SSB.  On receipt of the
           subsequent SSE, the lock is released.  For this usage, the
           managing switch sends an Acquire Change Authorization (ACA)
           request to other switches to lock the Fabric.

           For some other applications, a managing switch locks the
           Fabric using an Enhanced Acquire Change Authorization (EACA)
           request, which identifies the application on whose behalf
           the Fabric is being locked with an Application_ID.

           Fabric locks can also be requested more directly, e.g.,
           through the use of this MIB.  In these situations, the term
           'managing' switch is used to indicate the switch that
           receives such a request and executes it by issuing either
           ACA or EACA requests to other switches in the Fabric.

           This MIB module defines information about the 'managing'
           switch for currently-active Fabric locks.

           Copyright (C) The IETF Trust (2007).  This version
           of this MIB module is part of RFC 4936;  see the RFC
           itself for full legal notices."
    REVISION  "200706270000Z"
    DESCRIPTION
           "Initial version of this MIB module, published as RFC 4936."
    ::= { mib-2 159 }
```

```
t11FLockMIBObjects       OBJECT IDENTIFIER ::= { t11FabricLockMIB 1 }
t11FLockMIBConformance   OBJECT IDENTIFIER ::= { t11FabricLockMIB 2 }
t11FLockMIBNotifications OBJECT IDENTIFIER ::= { t11FabricLockMIB 0 }
t11FLockConfiguration    OBJECT IDENTIFIER ::= { t11FLockMIBObjects 1 }

--
-- The table of Managing Switches and their Fabric Locks
--

t11FLockTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11FLockEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A table containing information about the 'managing'
           switch of each current Fabric lock, e.g., for the
           types of Servers defined in FC-GS-5.

           Each entry in this table represents either:

           1) a current Fabric lock,
           2) an in-progress attempt, requested via SNMP, to set up
              a lock, or
           3) a failed attempt, requested via SNMP, to set up a lock.

           If an entry is created via t11FLockRowStatus, but the
           attempt to obtain the lock fails, then the entry continues
           to exist until it is deleted via t11FLockRowStatus, or
           it is overwritten by the lock being established via
           a means other than SNMP.  However, rows created via
           t11FLockRowStatus are not retained over restarts."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, sections 4.9.5 and 6.4.10.2."
    ::= { t11FLockConfiguration 1 }

t11FLockEntry OBJECT-TYPE
    SYNTAX       T11FLockEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry contains information specific to a current
           Fabric lock set up by a particular 'managing' switch on a
           particular Fabric.  The 'managing switch' is identified by
           values of fcmInstanceIndex and fcmSwitchIndex.

           Server sessions for several different types of servers
           are defined in FC-GS-5.  The behavior of a server with
```

respect to commands received within a server session is specified for each type of server. For some types, parameter changes can only be made within the context of a session, and the setting up of a session requires that the Fabric be locked. A Fabric is locked by one switch, called the 'managing' switch, sending Acquire Change Authorization (ACA) requests to all other switches in the Fabric.

For other applications, a Fabric lock is established by the 'managing' switch sending Enhanced Acquire Change Authorization (EACA) requests to other switches in the Fabric. Each EACA request includes an Application_ID value to identify the application requesting the lock.

For the benefit of this MIB module, a distinct value of Application_ID has also been assigned/reserved (see ANSI INCITS T11/06-679v0, titled 'FC-SW-5 Letter to T11.5') as a means of distinguishing locks established via Acquire Change Authorization (ACA) requests. This additional assignment allows an Application_ID to be used to uniquely identify any active lock amongst all those established by either an EACA or an ACA.

Whenever a Fabric is locked, by the sending of either an ACA or an EACA, a row gets created in the representation of this table for the 'managing' switch.

In order to process SNMP SetRequests that make parameter changes for the relevant types of servers (e.g., to the Zoning Database), the SNMP agent must get serialized access to the Fabric (for the relevant type of management data), i.e., the Fabric must be locked by creating an entry in this table via an SNMP SetRequest. Creating an entry in this table via an SNMP SetRequest causes an ACA or an EACA to be sent to all other switches in the Fabric. The value of t11FLockApplicationID for such an entry determines whether an ACA or an EACA is sent.

If an entry in this table is created by an SNMP SetRequest, the value of the t11FLockInitiatorType object in that entry will normally be 'snmp'. A row for which the value of t11FLockInitiatorType is not 'snmp' cannot be modified via SNMP. In particular, it cannot be deleted via t11FLockRowStatus. Note that it's possible for a row to be created by an SNMP SetRequest, but for the setup of the lock to fail, and immediately thereafter be replaced by a lock successfully set up by some other means; in such a case, the value of t11FLockInitiatorType would change as and when the

```
            lock was set up by the other means, and so the row could
            not thereafter be deleted via t11FLockRowStatus.

            FC-GS-5 mentions various error situations in which a
            Fabric lock is released so as to avoid a deadlock.  In
            such situations, the agent removes the corresponding row
            in this table as and when the lock is released.  This can
            happen for all values of t11FLockInitiatorType."
        REFERENCE
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, sections 4.9.5.5 and 6.4.7.1.

            Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, sections 6.1.17, 10.6.6, and 13.2,
            and table 116.

            'FC-SW-5 Letter to T11.5' ANSI INCITS T11/06-679v0,
            http://www.t11.org/ftp/t11/pub/fc/sw-5/06-679v0.pdf,
            21 September 2006."
        INDEX   { fcmInstanceIndex, fcmSwitchIndex, t11FLockFabricIndex,
                  t11FLockApplicationID }
        ::= { t11FLockTable 1 }

T11FLockEntry ::= SEQUENCE {
    t11FLockFabricIndex             T11FabricIndex,
    t11FLockApplicationID           OCTET STRING,
    t11FLockInitiatorType           INTEGER,
    t11FLockInitiator               OCTET STRING,
    t11FLockInitiatorIpAddrType     InetAddressType,
    t11FLockInitiatorIpAddr         InetAddress,
    t11FLockStatus                  INTEGER,
    t11FLockRejectReasonCode        T11NsGs4RejectReasonCode,
    t11FLockRejectReasonCodeExp     OCTET STRING,
    t11FLockRejectReasonVendorCode  OCTET STRING,
    t11FLockRowStatus               RowStatus
}

t11FLockFabricIndex OBJECT-TYPE
    SYNTAX       T11FabricIndex
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A unique index value that uniquely identifies a
            particular Fabric.

            In a Fabric conformant to FC-SW-4, multiple Virtual Fabrics
            can operate within one (or more) physical infrastructures,
            and this index value is used to uniquely identify a
```

```
            particular (physical or virtual) Fabric within a physical
            infrastructure.

            In a Fabric conformant to versions earlier than FC-SW-4,
            only a single Fabric could operate within a physical
            infrastructure, and thus, the value of this Fabric Index
            was defined to always be 1."
    ::= { t11FLockEntry 1 }

t11FLockApplicationID OBJECT-TYPE
    SYNTAX       OCTET STRING (SIZE (1))
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "The Application_ID value that identifies the type of
           application for which the Fabric is locked.

           A lock established via Acquire Change Authorization (ACA)
           does not, strictly speaking, have an Application_ID value.
           However, the value 'FF'h (255 decimal) has been reserved
           by T11 to be used as the value of this MIB object as and
           when a lock is established by an ACA.  This value was
           initially documented in a letter from the FC-SW-5 Editor
           to T11.5, which was approved by the T11 and T11.5 plenary
           meetings on October 5, 2006."
    REFERENCE
           "Fibre Channel - Switch Fabric-4 (FC-SW-4),
           ANSI INCITS 418-2006, April 2006, Table 116.

           'FC-SW-5 Letter to T11.5' ANSI INCITS T11/06-679v0,
           http://www.t11.org/ftp/t11/pub/fc/sw-5/06-679v0.pdf,
           21 September 2006."
    ::= { t11FLockEntry 2 }

t11FLockInitiatorType OBJECT-TYPE
    SYNTAX        INTEGER {
                      other(1),
                      ssb(2),
                      cli(3),
                      snmp(4)
                  }
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "This object specifies what type of initiator generated
           the request that caused this lock to be established:

               other     - none of the following.
```

```
                ssb       - this lock was established due to the
                            receipt of an SSB, e.g., from a GS-5
                            client.
                cli       - this lock was established in order
                            to process a Command Line Interface
                            (CLI) command.
                snmp      - this lock was established as a result
                            of an SNMP SetRequest.
            "
    ::= { t11FLockEntry 3 }

t11FLockInitiator OBJECT-TYPE
    SYNTAX          OCTET STRING (SIZE(0..64))
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
            "This object specifies the initiator whose request
            caused this lock to be established.

            If the value of the corresponding instance
            of t11FLockInitiatorType is 'ssb', this
            object will contain the FC_ID of the client
            that issued the Server Session Begin (SSB)
            that required the lock to be established.

            If the value of the corresponding instance
            of t11FLockInitiatorType object is 'cli', this
            object will contain the user name of the CLI
            (Command Line Interface) user on whose behalf
            the lock was established.

            If the value of the corresponding instance of
            t11FLockInitiatorType is 'snmp', this object
            will contain the SNMP securityName used by the
            SNMPv3 message containing the SetRequest that
            created this row.  (If the row was created via
            SNMPv1 or SNMPv2c, then the appropriate value of
            the snmpCommunitySecurityName is used.)"
    REFERENCE
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, section 4.9.5.2.

            SNMP securityName is defined in RFC 3411, 'An
            Architecture for Describing Simple Network
            Management Protocol (SNMP) Management Frameworks'.

            snmpCommunitySecurityName is defined in RFC 3584,
            'Coexistence between Version 1, Version 2, and
```

```
            Version 3 of the Internet-standard Network
            Management Framework.'"
    ::= { t11FLockEntry 4 }

t11FLockInitiatorIpAddrType OBJECT-TYPE
    SYNTAX          InetAddressType
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
            "This object specifies the type of IP address contained
            in the corresponding instance of t11FLockInitiatorIpAddr.
            If the IP address of the location of the initiator is
            unknown or not applicable, this object has the value:
            'unknown'."
    ::= { t11FLockEntry 5 }

t11FLockInitiatorIpAddr OBJECT-TYPE
    SYNTAX          InetAddress
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
            "This object specifies the IP address of the location
            of the initiator that established this lock via a
            request of the type given by the corresponding instance
            of t11FLockInitiatorType.  In cases where the
            corresponding instance of t11FLockInitiatorIpAddrType has
            the value: 'unknown', the value of this object is the
            zero-length string."
    ::= { t11FLockEntry 6 }

t11FLockStatus OBJECT-TYPE
    SYNTAX        INTEGER {
                      active(1),
                      settingUp(2),
                      rejectFailure(3),
                      otherFailure(4)
                  }
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "This object gives the current status of the lock:

               'active'        -- the lock is currently established.
               'settingUp'     -- the 'managing' switch is currently
                                  attempting to set up the lock, e.g.,
                                  it is waiting to receive Accepts
                                  for ACAs from every switch in the
                                  Fabric.
```

```
                'rejectFailure' -- the 'managing' switch's attempt to
                                   set up the lock was rejected with
                                   the reason codes given by:
                                      t11FLockRejectReasonCode,
                                      t11FLockRejectReasonCodeExp and
                                      t11FLockRejectReasonVendorCode.
                'otherFailure'  -- the 'managing' switch's attempt
                                   to set up the lock failed (but no
                                   reason codes are available).

            For values of t11FLockInitiatorType other than 'snmp',
            a row is only required to be instantiated in this table
            when the value of this object is 'active'.

            If the value of the corresponding instance of
            t11FLockInitiatorType is 'snmp', the initial value of this
            object when the row is first created is 'settingUp'.  As
            and when the setup succeeds, the value transitions to
            'active'.  If the setup fails, the value transitions to
            either 'rejectFailure' or 'otherFailure'.  Note that such a
            failure value is overwritten on the next attempt to obtain
            the lock, which could be immediately after the failure,
            e.g., by a GS-5 client.

            When the value of this object is 'rejectFailure', the
            rejection's reason codes are given by the corresponding
            values of t11FLockRejectReasonCode,
            t11FLockRejectReasonCodeExp and
            t11FLockRejectReasonVendorCode."
        ::= { t11FLockEntry 7 }

    t11FLockRejectReasonCode OBJECT-TYPE
        SYNTAX        T11NsGs4RejectReasonCode
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
               "When the value of the corresponding instance of
               t11FLockStatus is 'rejectFailure', this object contains
               the rejection's reason code."
        REFERENCE
               "Fibre Channel - Generic Services-5 (FC-GS-5),
               ANSI INCITS 427-2007, section 4.4.4 and table 10."
        ::= { t11FLockEntry 8 }

    t11FLockRejectReasonCodeExp OBJECT-TYPE
        SYNTAX        OCTET STRING (SIZE(0 | 1))
        MAX-ACCESS    read-only
        STATUS        current
```

```
    DESCRIPTION
           "When the value of the corresponding instance of
           t11FLockStatus is 'rejectFailure', this object contains
           the rejection's reason code explanation."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, sections 4.4.4 and 6.4.9,
           tables 10 and 252."
    ::= { t11FLockEntry 9 }

t11FLockRejectReasonVendorCode OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE(0 | 1))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "When the value of the corresponding instance of
           t11FLockStatus is 'rejectFailure', this object contains
           the rejection's vendor-specific code."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 4.4.4."
    ::= { t11FLockEntry 10 }

t11FLockRowStatus OBJECT-TYPE
    SYNTAX        RowStatus
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
           "The status of this conceptual row.

           A row in this table can be modified or deleted via
           this object only when the row's value of
           t11FLockInitiatorType is 'snmp'."
    ::= { t11FLockEntry 11 }

-- Conformance

t11FLockMIBCompliances
                     OBJECT IDENTIFIER ::= { t11FLockMIBConformance 1 }
t11FLockMIBGroups    OBJECT IDENTIFIER ::= { t11FLockMIBConformance 2 }

t11FLockMIBCompliance MODULE-COMPLIANCE
    STATUS       current
    DESCRIPTION
           "The compliance statement for entities that support
           Fabric locks in support of GS-5 Server applications."
    MODULE MANDATORY-GROUPS { t11FLockActiveGroup }
```

```
    OBJECT       t11FLockRowStatus
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    ::= { t11FLockMIBCompliances 1 }

-- Units of Conformance

t11FLockActiveGroup OBJECT-GROUP
    OBJECTS  { t11FLockInitiatorType,
               t11FLockInitiator,
               t11FLockInitiatorIpAddrType,
               t11FLockInitiatorIpAddr,
               t11FLockStatus,
               t11FLockRejectReasonCode,
               t11FLockRejectReasonCodeExp,
               t11FLockRejectReasonVendorCode,
               t11FLockRowStatus
             }
    STATUS   current
    DESCRIPTION
           "A collection of objects containing information
           about current Fabric locks."
    ::= { t11FLockMIBGroups 1 }

END
```

7. The T11-FC-ZONE-SERVER-MIB Module

```
T11-FC-ZONE-SERVER-MIB  DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE,
    NOTIFICATION-TYPE, mib-2,
    Counter32, Unsigned32
                        FROM SNMPv2-SMI                   -- [RFC2578]
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP
                        FROM SNMPv2-CONF                  -- [RFC2580]
    TEXTUAL-CONVENTION, RowStatus,
    StorageType,
    TruthValue, TimeStamp
                        FROM SNMPv2-TC                    -- [RFC2579]
    SnmpAdminString
                        FROM SNMP-FRAMEWORK-MIB           -- [RFC3411]
    ifIndex             FROM IF-MIB                       -- [RFC2863]
    fcmInstanceIndex, fcmSwitchIndex,
    FcNameIdOrZero,
    FcDomainIdOrZero    FROM FC-MGMT-MIB                  -- [RFC4044]
    T11NsGs4RejectReasonCode
                        FROM T11-FC-NAME-SERVER-MIB       -- [RFC4438]
    T11FabricIndex      FROM T11-TC-MIB                   -- [RFC4439]
    t11FamLocalSwitchWwn
                        FROM T11-FC-FABRIC-ADDR-MGR-MIB; -- [RFC4439]

t11ZoneServerMIB  MODULE-IDENTITY
    LAST-UPDATED  "200706270000Z"
    ORGANIZATION  "For the initial versions, T11.
                   For later versions, the IETF's IMSS Working Group."
    CONTACT-INFO
            "     Claudio DeSanti
                  Cisco Systems, Inc.
                  170 West Tasman Drive
                  San Jose, CA 95134 USA
                  EMail: cds@cisco.com

                  Keith McCloghrie
                  Cisco Systems, Inc.
                  170 West Tasman Drive
                  San Jose, CA 95134 USA
                  EMail: kzm@cisco.com"

    DESCRIPTION
           "The MIB module for the management of Fibre Channel Zoning
           Servers, both for Basic Zoning Management and for Enhanced
```

Zoning Management, as defined in the FC-GS-5 specification.

FC-GS-5 defines (in-band) management operations for manipulating the Zone Set Database, some for use in Basic mode (e.g., 'Add Zone Set (AZS)', etc.), and some for use in Enhanced mode (e.g., Create Zone Set (CZS)', etc.). When Enhanced Zoning Management is in use, FC-GS-5 requires that these in-band management operations be rejected unless they are issued within the context of a GS-5 server session. The use of a server session ensures serialized access to the Zoning Database since the Fabric lock for the Zone Server must be obtained as a part of establishing the server session to the Zone Server.

Thus, if and when this MIB is used for Enhanced Zoning Management, SNMP SetRequests that request the modification of zoning definitions must be serialized with respect to the GS-5 requests to modify the Zoning Database. This is achieved by requiring that an SNMP management application must first obtain the Fabric lock for the Zone Server before attempting to modify any zoning definitions. The companion T11-FC-FABRIC-LOCK-MIB module is defined as a means of obtaining the Fabric lock for the Zone Server (or any other server).

In Enhanced Zoning Management, a Zone Server keeps track of changes requested in the zoning definitions, but does not update its Zone Set Database unless there is (and until there is) a 'commit' operation. To model this behavior, this MIB module assumes that a Zone Server (in Enhanced mode) takes a snapshot of its Zone Set Database as and when the Fabric lock (for the Zone Server application) is obtained; this snapshot is used to create what is herein called the 'copy' database. It is this 'copy' database that is then updated by SNMP SetRequests (while the Fabric is locked). If and when a 'commit' operation is requested (while the Fabric is still locked), the 'copy' database is then used to overwrite the previously committed contents of the Zone Set Database, and the new Zone Set Database is distributed to all other switches in the Fabric. When the lock is released, any changes made that were not 'committed' are discarded.

When this MIB is used for Basic Zoning Management, the same set of MIB objects as used for Enhanced mode are used to make changes to the Database of a Zone Server on a particular switch, but the changes take immediate effect at that switch without an explicit commit. The distribution of

```
            those changes to Zone Servers on other switches in the
            Fabric is subsequently requested through the use of a
            separate set of MIB objects.

            The management information specified in this MIB module
            includes the Zoning Database for each of one or more Fibre
            Channel Fabrics.  A Zoning Database is a combination of the
            Fabric's Zone Set Database and its Active Zone Set.  The
            Active Zone Set is the Zone Set currently enforced by the
            Fabric; a Zone Set Database is a database of the Zone Sets
            available to be activated within a Fabric.  All the MIB
            objects representing a Zone Set Database are modifiable at
            any time (irrespective of the value of any RowStatus
            object), whereas all objects representing the Active Zone
            Set are always read-only (except to deactivate it and/or
            activate a different one).

            Copyright (C) The IETF Trust (2007).  This version
            of this MIB module is part of RFC 4936;  see the RFC
            itself for full legal notices."
    REVISION  "200706270000Z"
    DESCRIPTION
            "Initial version of this MIB module, published as RFC 4936."
    ::= { mib-2 160 }

t11ZsMIBObjects        OBJECT IDENTIFIER ::= { t11ZoneServerMIB 1 }
t11ZsMIBConformance    OBJECT IDENTIFIER ::= { t11ZoneServerMIB 2 }
t11ZsMIBNotifications  OBJECT IDENTIFIER ::= { t11ZoneServerMIB 0 }
t11ZsConfiguration     OBJECT IDENTIFIER ::= { t11ZsMIBObjects 1 }
t11ZsStatistics        OBJECT IDENTIFIER ::= { t11ZsMIBObjects 2 }

-- Textual Conventions

T11ZsZoneMemberType ::= TEXTUAL-CONVENTION
    DISPLAY-HINT  "x"
    STATUS        current
    DESCRIPTION
            "Represents the addressing mechanism by
            which a member is identified:

                 01 - N_Port_Name
                 02 - Domain_ID and physical port
                 03 - N_Port_ID
                 04 - Node_Name
                 05 - Alias Name
                 06 - F_Port_Name
                 E0-FF (hex) - Vendor Specific.
            "
```

```
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.8.3.6."
    SYNTAX       Unsigned32 (0..255)

T11ZsRejectReasonExplanation ::= TEXTUAL-CONVENTION
    STATUS       current
    DESCRIPTION
           "The reason code explanation when rejecting a
           Zone Server request:

              'other'
                  - e.g., a reason code assigned too recently
                    to be included in this version of this MIB
              'noAdditionalExplanation'
                  - there is no additional explanation
              'zonesNotSupported'
                  - Zones are not supported
              'zoneSetNameUnknown'
                  - Zone Set name is not known
              'noZoneSetActive'
                  - no Zone Set is currently active
              'zoneNameUnknown'
                  - Zone name is unknown
              'zoneStateUnknown'
                  - state of the Zone is not known
              'incorrectPayloadLen'
                  - payload length is not correct
              'tooLargeZoneSet'
                  - Zone Set is larger than permitted size
              'deactivateZoneSetFailed'
                  - deactivation of Zone Set failed
              'reqNotSupported'
                  - request is not supported
              'capabilityNotSupported'
                  - capability is not supported
              'zoneMemberIDTypeNotSupp'
                  - Zone Member Identifier Type is not supported
              'invalidZoneSetDefinition'
                  - Zone Set definition is invalid
              'enhancedZoningCmdsNotSupported'
                  - Enhanced Zoning commands are not supported
              'zoneSetExists'
                  - Zone Set already exists
              'zoneExists'
                  - Zone already exists
              'aliasExists'
                  - Zone Alias already exists
```

```
                'zoneSetUnknown'
                    - Zone Set unknown
                'zoneUnknown'
                    - Zone unknown
                'aliasUnknown'
                    - Zone Alias unknown
                'zoneAliasTypeUnknown'
                    - unknown Zone attribute type
                'unableEnhancedMode'
                    - Fabric unable to work in Enhanced Mode
                'basicZoningCmdsNotSupported'
                    - Basic Zoning commands are not supported
                'zoneAttribObjectExists'
                    - Zone attribute object already exists
                'zoneAttribObjectUnknown'
                    - Zone attribute object unknown
                'requestInProcess'
                    - request in process
                'cmitInProcess'
                    - CMIT in process
                'hardEnforcementFailed'
                    - hard enforcement failed
                'unresolvedReferences'
                    - unresolved references in the Zone Set Database
                'consistencyChecksFailed'
                    - consistency checks failed."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.9."
    SYNTAX        INTEGER {
                      other(1),
                      noAdditionalExplanation(2),
                      zonesNotSupported(3),
                      zoneSetNameUnknown(4),
                      noZoneSetActive(5),
                      zoneNameUnknown(6),
                      zoneStateUnknown(7),
                      incorrectPayloadLen(8),
                      tooLargeZoneSet(9),
                      deactivateZoneSetFailed(10),
                      reqNotSupported(11),
                      capabilityNotSupported(12),
                      zoneMemberIDTypeNotSupp(13),
                      invalidZoneSetDefinition(14),
                      enhancedZoningCmdsNotSupported(15),
                      zoneSetExists(16),
                      zoneExists(17),
                      aliasExists(18),
```

```
                        zoneSetUnknown(19),
                        zoneUnknown(20),
                        aliasUnknown(21),
                        zoneAliasTypeUnknown(22),
                        unableEnhancedMode(23),
                        basicZoningCmdsNotSupported(24),
                        zoneAttribObjectExists(25),
                        zoneAttribObjectUnknown(26),
                        requestInProcess(27),
                        cmitInProcess(28),
                        hardEnforcementFailed(29),
                        unresolvedReferences(30),
                        consistencyChecksFailed(31)
                    }

T11ZoningName ::= TEXTUAL-CONVENTION
    STATUS        current
    DESCRIPTION
           "This datatype is a refinement of an SnmpAdminString,
           and is used to represent a name stored in a Fibre
           Channel Zoning Data Structure.

           The value begins with an ASCII letter (upper or lower
           case) followed by zero or more characters from the set:
           lower case letters, upper case letters, numbers, and
           the symbols ($-^_).

           The value does not include fill bytes."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.8.1."
    SYNTAX       OCTET STRING (SIZE (1..64))

--
-- The table of Zone Servers
--

t11ZsServerTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsServerEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A table containing information about the Zone Servers
           on each Fabric in one or more switches, and providing
           the capability to perform operations on their Zone
           Server databases."
    ::= { t11ZsConfiguration 1 }
```

```
t11ZsServerEntry OBJECT-TYPE
    SYNTAX       T11ZsServerEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry contains information specific to a
           Zone Server for a particular Fabric (identified by
           the value of t11ZsServerFabricIndex) on a particular
           switch (identified by values of fcmInstanceIndex
           and fcmSwitchIndex).

           The persistence across reboots of writable values in
           a row of this table is given by the instance of
           t11ZsServerDatabaseStorageType in that row."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex }
    ::= { t11ZsServerTable 1 }

T11ZsServerEntry ::= SEQUENCE {
    t11ZsServerFabricIndex           T11FabricIndex,
    t11ZsServerCapabilityObject      BITS,
    t11ZsServerDatabaseStorageType   StorageType,
    t11ZsServerDistribute            INTEGER,
    t11ZsServerCommit                INTEGER,
    t11ZsServerResult                INTEGER,
    t11ZsServerReasonCode            T11NsGs4RejectReasonCode,
    t11ZsServerReasonCodeExp         OCTET STRING,
    t11ZsServerReasonVendorCode      OCTET STRING,
    t11ZsServerLastChange            TimeStamp,
    t11ZsServerHardZoning            TruthValue,
    t11ZsServerReadFromDatabase      INTEGER,
    t11ZsServerOperationMode         INTEGER,
    t11ZsServerChangeModeResult      INTEGER,
    t11ZsServerDefaultZoneSetting    INTEGER,
    t11ZsServerMergeControlSetting   INTEGER,
    t11ZsServerDefZoneBroadcast      TruthValue
}

t11ZsServerFabricIndex OBJECT-TYPE
    SYNTAX       T11FabricIndex
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A unique index value that uniquely identifies a
           particular Fabric."
    ::= { t11ZsServerEntry 1 }

t11ZsServerCapabilityObject OBJECT-TYPE
```

```
    SYNTAX        BITS {
                      enhancedMode(0),
                      zoneSetDb(1),
                      activateDirect(2),
                      hardZoning(3)
                  }
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "This bitmap represents the capability of the switch
           on this Fabric:

               'enhancedMode' - able to support enhanced Zoning
                                mode of operation.

               'zoneSetDb'    - able to support maintaining of
                                a Zone Set Database.

               'activateDirect' - able to support the Activate
                                  Direct command.

               'hardZoning'   - able to support Hard Zoning."
    REFERENCE
           "Fibre Channel - Switch Fabric-4 (FC-SW-4),
           ANSI INCITS 418-2006, April 2006, section 6.1.23.4.4"
    ::= { t11ZsServerEntry 2 }

t11ZsServerDatabaseStorageType OBJECT-TYPE
    SYNTAX       StorageType
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
           "This object specifies the memory realization, on a
           particular switch, of the Zone Set database for a
           particular Fabric.  Specifically, each row in the
           following tables:

                     t11ZsSetTable
                     t11ZsZoneTable
                     t11ZsSetZoneTable
                     t11ZsAliasTable
                     t11ZsZoneMemberTable
                     t11ZsAttribBlockTable
                     t11ZsAttribTable

           has a StorageType as specified by the instance of
           this object that is INDEXed by the same values of
           fcmInstanceIndex, fcmSwitchIndex, and
```

```
            t11ZsServerFabricIndex.

            The value of this object is also used to indicate
            the persistence across reboots of writable values in
            its row of the t11ZsServerTable, as well as the
            corresponding row in the t11ZsNotifyControlTable.

            If an instance of this object has the value
            'permanent(4)', the Zone Set database for the given
            Fabric on the given switch is not required to be
            writeable."
    DEFVAL { nonVolatile }
    ::= { t11ZsServerEntry 3 }

t11ZsServerDistribute OBJECT-TYPE
    SYNTAX       INTEGER {
                     noop(1),
                     zoneSetDb(2)
                 }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
            "This object can be set only in Basic mode.  When set
            to the value 'zoneSetDb', it requests that the Zone Set
            database of a particular switch for a particular Fabric
            be distributed to every other switch in that Fabric,
            e.g., by using Stage Fabric Configuration Update (SFC)
            and Update Fabric Configuration (UFC) requests.

            Setting this object to 'noop' has no effect.
            When read, the value of this object is always 'noop'.

            When the corresponding instance of t11ZsServerOperationMode
            has the value 'enhanced', or when the corresponding instance
            of t11ZsZoneSetResult has the value 'inProgress', it
            is inconsistent to try to set the value of this object."
    REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, section 6.1.19.1."
    ::= { t11ZsServerEntry 4 }

t11ZsServerCommit OBJECT-TYPE
    SYNTAX        INTEGER {
                      commitZoneChanges(1),
                      noop(2)
                  }
    MAX-ACCESS    read-write
    STATUS        current
```

```
    DESCRIPTION
            "This object is only used in Enhanced mode.

            In Enhanced mode, it can only be modified when the Fabric
            lock for the Zone Server on the particular Fabric has been
            obtained for use by SNMP SetRequests, and even then, only
            by the SNMP entity identified by the value of corresponding
            instance of t11FLockInitiator.

            Setting the object requests an action:

              commitZoneChanges - requests that the changes made
                                  within this session to the Zone
                                  Set Database be committed.
              noop              - requests nothing.

             When read, the value is always 'noop'."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.10.2."
    ::= { t11ZsServerEntry 5 }

t11ZsServerResult OBJECT-TYPE
    SYNTAX       INTEGER {
                     none(1),
                     inProgress(2),
                     success(3),
                     rejectFailure(4),
                     otherFailure(5)
                 }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "In Basic mode, this object indicates the status/result
           of the last distribution of the Zone Set database that
           was invoked via the corresponding instance of
           t11ZsZoneSetDistribute, e.g., the status/result of
           Stage Fabric Configuration Update (SFC) request(s) used
           to implement the setting of t11ZsZoneSetDistribute.

           In Enhanced mode, this object indicates the status/result
           of the last commit of changes to the Zone Set database
           that was invoked via the corresponding instance of
           t11ZsServerCommit.

             'none'          - no distribution/commit invoked
                               via the corresponding instance of
                               t11ZsZoneSetDistribute (Basic mode)
```

```
                                or t11ZsServerCommit (Enhanced mode).
                  'inProgress'    - distribution/commit is still in
                                    progress.
                  'success'       - distribution/commit completed
                                    successfully.
                  'rejectFailure' - distribution/commit failed due to
                                    an SW_RJT.
                  'otherFailure'  - distribution/commit failed for some
                                    other reason.

                When the value is 'rejectFailure', the corresponding
                instances of t11ZsServerReasonCode,
                t11ZsServerReasonCodeExp and t11ZsServerReasonVendorCode
                contain the reason codes. "
        REFERENCE
                "Fibre Channel - Generic Services-5 (FC-GS-5),
                ANSI INCITS 427-2007, section 6.4.10.2.3."
        ::= { t11ZsServerEntry 6 }

    t11ZsServerReasonCode OBJECT-TYPE
        SYNTAX       T11NsGs4RejectReasonCode
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
                "When the corresponding instance of t11ZsZoneSetResult
                has the value 'rejectFailure', this object contains
                the rejection's reason code.

                When the corresponding instance of t11ZsServerResult
                has a value other than 'rejectFailure', this object
                should contain the value 'none'."
        REFERENCE
                "Fibre Channel - Switch Fabric-4 (FC-SW-4),
                ANSI INCITS 418-2006, April 2006, section 6.1.3 and
                tables 4, 5, and 6."
        ::= { t11ZsServerEntry 7 }

    t11ZsServerReasonCodeExp OBJECT-TYPE
        SYNTAX       OCTET STRING (SIZE (0 | 1))
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
                "When the corresponding instance of t11ZsZoneSetResult
                has the value 'rejectFailure', this object contains
                the rejection's reason code explanation.

                When the corresponding instance of t11ZsServerResult
                has a value other than 'rejectFailure', this object
```

```
            should contain the zero-length string."
        REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, section 6.1.3 and
            tables 4, 5, and 6."
        ::= { t11ZsServerEntry 8 }

    t11ZsServerReasonVendorCode OBJECT-TYPE
        SYNTAX       OCTET STRING (SIZE (0 | 1))
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "When the corresponding instance of t11ZsZoneSetResult
            has the value 'rejectFailure', this object contains
            the rejection's reason vendor-specific code.

            When the corresponding instance of t11ZsServerResult
            has a value other than 'rejectFailure', this object
            should contain the zero-length string."
        REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, section 6.1.3 and
            tables 4, 5, and 6."
        ::= { t11ZsServerEntry 9 }

    t11ZsServerLastChange OBJECT-TYPE
        SYNTAX       TimeStamp
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The value of sysUpTime at the time of the last change
            (creation, modification, or deletion) to the Zone Set
            database for the Zone Server for a particular Fabric.
            If said Zone Set database has not changed since the
            last re-initialization of the local network management
            system, then this object will contain a zero value."
        ::= { t11ZsServerEntry 10 }

    t11ZsServerHardZoning OBJECT-TYPE
        SYNTAX       TruthValue
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "This object indicates whether this switch, if and when it
            is in Basic mode, enforces Hard Zoning on this Fabric."
        REFERENCE
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, section 6.4.10.3.2."
```

```
    ::= { t11ZsServerEntry 11 }

t11ZsServerReadFromDatabase OBJECT-TYPE
    SYNTAX        INTEGER {
                      committedDB(1),
                      copyDB(2)
                  }
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
           "In Enhanced mode, this object specifies whether
           subsequent SNMP Responses (generated by the local SNMP
           agent) to operations that read the configuration of
           Zone Sets, Zones, Members, Aliases and Attributes will
           reflect the values stored in the current (committed)
           Zone Set database, or those stored in the 'copy'
           database.

           In Basic mode, the value of this object is always
           'committedDB' (since there is no 'copy' database in
           Basic mode).  In SNMP agents that don't support
           write access to the Zone Set database, this object
           is always 'committedDB' (since the copy database,
           if it were to exist, would be identical)."
    DEFVAL { committedDB }
    ::= { t11ZsServerEntry 12 }

t11ZsServerOperationMode OBJECT-TYPE
    SYNTAX        INTEGER {
                      basic(1),
                      enhanced(2)
                  }
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
           "The operational mode of the Zone Server.

           Setting this object to 'enhanced' is a request that the mode
           of operation of the Zone Server be Enhanced mode, which is
           only possible if all devices in the Fibre Channel Fabric are
           capable of working in Enhanced mode.  If not, the request
           will fail and the corresponding value of
           t11ZsServerChangeModeResult will so indicate.

           Setting this object to 'basic' is a request that the mode
           of operation of the Zone Server be Basic mode.  However,
           such a set may fail while operating in Enhanced mode,
           since FC-GS-5 makes no provision for changing (back)
```

```
            to Basic mode.

            Note that setting this object does not cause or require
            that the Fabric lock for the Zone Server be obtained.
            However, when this object has the value 'enhanced', any SNMP
            SetRequests that attempt to modify the copy database cannot
            be successful if the Fabric lock has not been obtained
            or has since been released."
    REFERENCE
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, sections 6.4.10.1.1 and 6.4.10.1.2."
    DEFVAL { basic }
    ::= { t11ZsServerEntry 13 }

t11ZsServerChangeModeResult OBJECT-TYPE
    SYNTAX        INTEGER {
                      success(1),
                      failure(2),
                      inProgress(3),
                      none(4)
                  }
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "When this object has the value of 'success' or
            'failure', the value indicates the outcome of the most
            recent request, invoked via t11ZsServerOperationMode,
            to change the mode of operation of the Zone Server.
            When such a request is in progress, this object has the
            value 'inProgress'.  Prior to the first such request,
            the value of this object is 'none'."
    ::= { t11ZsServerEntry 14 }

t11ZsServerDefaultZoneSetting OBJECT-TYPE
    SYNTAX       INTEGER {
                     permit(1),
                     deny(2)
                 }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
            "This object controls the Enhanced Zoning flag that
            governs the behavior of the Default Zone on this Fabric.

            If this object is set to 'permit', then the members of
            the Default Zone on this Fabric can communicate with
            each other.
```

```
            If this object is set to 'deny', then the members of the
            Default Zone on this Fabric cannot communicate with each
            other."
        REFERENCE
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, section 6.4.10.1.1."
        DEFVAL  { deny }
        ::= { t11ZsServerEntry 15 }

    t11ZsServerMergeControlSetting OBJECT-TYPE
        SYNTAX          INTEGER {
                            allow(1),
                            restrict(2)
                        }
        MAX-ACCESS      read-write
        STATUS          current
        DESCRIPTION
            "This object controls the Enhanced Zoning flag that
            indicates the Merge Control Setting for this Fabric:

                'allow'    - a switch may join the Fabric only if
                             its Zoning Database is able to merge
                             with the Fabric's Zoning Database.
                'restrict' - a switch may join the Fabric only if
                             its Zoning Database is equal to the
                             Fabric's Zoning Database."
        REFERENCE
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, section 6.4.10.1.1."
        DEFVAL { allow }
        ::= { t11ZsServerEntry 16 }

    t11ZsServerDefZoneBroadcast OBJECT-TYPE
        SYNTAX       TruthValue
        MAX-ACCESS   read-write
        STATUS       current
        DESCRIPTION
            "This object controls an Enhanced Zoning capability:
            it indicates whether Broadcast Zoning is enabled on
            the Default Zone on this Fabric.  If this object is
            set to 'true', then it is enabled.  If this object is
            set to 'false', then it is disabled.

            If broadcast Zoning is enabled on a Default Zone,
            then broadcast frames generated by a member in that
            Default Zone will be restricted to members in that
            Default Zone."
        REFERENCE
```

```
            "Fibre Channel - Generic Services-5 (FC-GS-5),
            ANSI INCITS 427-2007, section 6.4.7.2.2."
    ::= { t11ZsServerEntry 17 }

--
-- The table of Zone Sets
--

t11ZsSetTable  OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsSetEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A table containing information on every Zone
            Set in the Zone Set database of the Zone Servers
            on each Fabric in one or more switches.

            In Enhanced mode, changes to a database made via this
            table are always made to the 'copy' database, but
            values read from this table reflect the contents of
            either the 'copy' database or the current (committed)
            database as indicated by the corresponding value of
            t11ZsServerReadFromDatabase."
    ::= { t11ZsConfiguration 2 }

t11ZsSetEntry  OBJECT-TYPE
    SYNTAX       T11ZsSetEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each entry contains information about a Zone Set
            in the Zone Set database of a particular Fabric
            (identified by the value of t11ZsServerFabricIndex)
            on a particular switch (identified by values of
            fcmInstanceIndex and fcmSwitchIndex).

            A Zone Set can be created in an existing Zone Set
            database, and can contain zero or more existing
            Zones.  As and when new Zones are created
            (as rows in the t11ZsZoneTable), they can be added
            to a Zone Set by creating an entry for each in the
            t11ZsSetZoneTable.  Deleting a row from this table
            deletes the Zone Set from the Zone Set database
            maintained by the Zone Server, but does not otherwise
            affect the Zone Server.

            The StorageType of a row in this table is specified by
            the instance of t11ZsServerDatabaseStorageType that is
```

```
            INDEXed by the same values of fcmInstanceIndex,
            fcmSwitchIndex, and t11ZsServerFabricIndex."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex, t11ZsSetIndex }
    ::= { t11ZsSetTable 1 }

T11ZsSetEntry ::= SEQUENCE {
    t11ZsSetIndex          Unsigned32,
    t11ZsSetName           T11ZoningName,
    t11ZsSetRowStatus      RowStatus
}

t11ZsSetIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "The index of a Zone Set.  This object uniquely
            identifies a Zone Set in the Zone Set database
            for a particular Fabric on a particular switch."
    ::= { t11ZsSetEntry 1 }

t11ZsSetName OBJECT-TYPE
    SYNTAX       T11ZoningName
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
            "The name of this Zone Set.  The t11ZsSetName should
            be unique within a Fabric.

            The Zone Set can be renamed at any time (i.e., even
            when the row in an active state) by setting this object
            to a new value."
    ::= { t11ZsSetEntry 2 }

t11ZsSetRowStatus OBJECT-TYPE
    SYNTAX       RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
            "The status of this conceptual row.

            This object cannot be set to 'active' unless the
            corresponding value of t11ZsSetName is unique within
            the Fabric's Zone Server database on this switch."
    ::= { t11ZsSetEntry 3 }
```

```
--
-- The table of Zones
--

t11ZsZoneTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsZoneEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This table gives information on all the Zones in the
           Zone Set database of the Zone Servers on each Fabric
           in one or more switches.

           In Enhanced mode, changes to a database made via this
           table are always made to the 'copy' database, but
           values read from this table reflect the contents of
           either the 'copy' database or the current (committed)
           database as indicated by the corresponding value of
           t11ZsServerReadFromDatabase."
    ::= { t11ZsConfiguration 3 }

t11ZsZoneEntry OBJECT-TYPE
    SYNTAX       T11ZsZoneEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry contains information about a Zone
           in the Zone Set database of a particular Fabric
           (identified by the value of t11ZsServerFabricIndex)
           on a particular switch (identified by values of
           fcmInstanceIndex and fcmSwitchIndex).

           A Zone can be created in an existing Zone Set
           database, by first creating an entry in this table,
           and then adding members to it by creating entries in the
           t11ZsZoneMemberTable.

           The StorageType of a row in this table is specified by
           the instance of t11ZsServerDatabaseStorageType that is
           INDEXed by the same values of fcmInstanceIndex,
           fcmSwitchIndex, and t11ZsServerFabricIndex."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex, t11ZsZoneIndex }
    ::= { t11ZsZoneTable 1 }

T11ZsZoneEntry ::= SEQUENCE {
    t11ZsZoneIndex             Unsigned32,
    t11ZsZoneName              T11ZoningName,
```

```
    t11ZsZoneAttribBlock       Unsigned32,
    t11ZsZoneRowStatus         RowStatus
}

t11ZsZoneIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "An index value that uniquely identifies this
           Zone within a particular Fabric's Zone Set database
           on a particular switch."
    ::= { t11ZsZoneEntry 1 }

t11ZsZoneName OBJECT-TYPE
    SYNTAX       T11ZoningName
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The name of this Zone.  The t11ZsZoneName should be
           unique within a Fabric.

           The Zone can be renamed by setting this object
           to a new value."
    ::= { t11ZsZoneEntry 2 }

t11ZsZoneAttribBlock OBJECT-TYPE
    SYNTAX       Unsigned32 (0..4294967295)
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "This object specifies the index value of the
           Zone Attribute Block that contains the Attributes
           of this Zone.

           In Enhanced mode, a value of zero indicates this
           Zone has no Zone Attributes.  In Basic mode, this
           object always has the value of zero."
    ::= { t11ZsZoneEntry 3 }

t11ZsZoneRowStatus OBJECT-TYPE
    SYNTAX       RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The status of this conceptual row.

           This object cannot be set to 'active' unless the
```

```
            corresponding value of t11ZsZoneName is unique within
            the Fabric's Zone Server database on this switch."
    ::= { t11ZsZoneEntry 4 }

--
-- The table specifying the Zones that belong to each Zone Set
--

t11ZsSetZoneTable  OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsSetZoneEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "This table specifies which Zones belong to which Zone
            Sets in the Zone Set database of the Zone Servers
            on each Fabric in one or more switches."
    ::= { t11ZsConfiguration 4 }

t11ZsSetZoneEntry  OBJECT-TYPE
    SYNTAX       T11ZsSetZoneEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each entry specifies that a particular Zone (identified
            by the value of t11ZsZoneIndex) is one of the Zones
            that form a particular Zone Set (identified by the
            value of t11ZsSetIndex) in the Zone Set database of a
            particular Fabric (identified by the value of
            t11ZsServerFabricIndex) on a particular switch
            (identified by values of fcmInstanceIndex and
            fcmSwitchIndex).

            When a row in this table exists, it references one row in
            the t11ZsSetTable and one row in the t11ZsZoneTable.  The
            agent must ensure that both such rows when referenced by an
            active row in this table, do exist and have a status of
            'active', either by refusing to create new rows in this
            table, or by automatically deleting rows in this table.

            An 'active' row in this table references one row in the
            t11ZsSetTable and one in the t11ZsZoneTable.  The agent must
            ensure that all such referenced rows exist with a status of
            'active', either by refusing to create new active rows in
            this table, or by automatically deleting any rows in this
            table that reference a deleted row.

            The StorageType of a row in this table is specified by
            the instance of t11ZsServerDatabaseStorageType that is
```

```
            INDEXed by the same values of fcmInstanceIndex,
            fcmSwitchIndex, and t11ZsServerFabricIndex."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex,
              t11ZsSetIndex, t11ZsZoneIndex }
    ::= { t11ZsSetZoneTable 1 }

T11ZsSetZoneEntry ::= SEQUENCE {
    t11ZsSetZoneRowStatus      RowStatus
}

t11ZsSetZoneRowStatus OBJECT-TYPE
    SYNTAX       RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
            "The status of this conceptual row."
    ::= { t11ZsSetZoneEntry 1 }

--
-- The table of Zone Aliases
--

t11ZsAliasTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsAliasEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "This table contains information about the Zone Aliases
            in the Zone Set database of the Zone Servers on each
            Fabric in one or more switches.

            In Enhanced mode, changes to a database made via this
            table are always made to the 'copy' database, but
            values read from this table reflect the contents of
            either the 'copy' database or the current (committed)
            database as indicated by the corresponding value of
            t11ZsServerReadFromDatabase."
    ::= { t11ZsConfiguration 5 }

t11ZsAliasEntry OBJECT-TYPE
    SYNTAX       T11ZsAliasEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each entry contains information about a Zone Alias in
            the Zone Set database of a particular Fabric
            (identified by the value of t11ZsServerFabricIndex) on
```

```
            a particular switch (identified by values of
            fcmInstanceIndex and fcmSwitchIndex).

            A Zone Member is added to a Zone Alias by creating
            an entry in the t11ZsZoneMemberTable pointing to a
            row of this table via t11ZsAliasIndex, i.e.,:

             - t11ZsZoneMemberParentType = 'alias',
             - t11ZsZoneMemberParentIndex = Alias's t11ZsAliasIndex,
             - t11ZsZoneMemberFormat != '05 - Alias Name', and
             - t11ZsZoneMemberID = Member's identifier.

            A Zone Alias is added to a Zone by creating
            an entry in the t11ZsZoneMemberTable pointing to a
            row of this table via t11ZsAliasName, i.e.,:

             - t11ZsZoneMemberParentType = 'zone',  and
             - t11ZsZoneMemberParentIndex = Zone's t11ZsZoneIndex,
             - t11ZsZoneMemberFormat = '05 - Alias Name',
             - t11ZsZoneMemberID = Alias's t11ZsAliasName.

            The StorageType of a row in this table is specified by
            the instance of t11ZsServerDatabaseStorageType that is
            INDEXed by the same values of fcmInstanceIndex,
            fcmSwitchIndex, and t11ZsServerFabricIndex."
        INDEX   { fcmInstanceIndex, fcmSwitchIndex,
                  t11ZsServerFabricIndex, t11ZsAliasIndex }
        ::= { t11ZsAliasTable 1 }

T11ZsAliasEntry ::= SEQUENCE {
        t11ZsAliasIndex           Unsigned32,
        t11ZsAliasName            T11ZoningName,
        t11ZsAliasRowStatus       RowStatus
}

t11ZsAliasIndex OBJECT-TYPE
        SYNTAX       Unsigned32 (1..4294967295)
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
               "An index value which uniquely identifies this Zone
               Alias within the Zone Set database of a particular
               Fabric on a particular switch."
        ::= { t11ZsAliasEntry 1 }

t11ZsAliasName OBJECT-TYPE
        SYNTAX       T11ZoningName
        MAX-ACCESS   read-create
```

```
    STATUS       current
    DESCRIPTION
           "The name of this Zone Alias.  The name of the Zone
           Alias should be unique within a Fabric.

           The Zone Alias can be renamed by setting this object
           to a new value if and when it is not in a Zone, i.e.,
           if and only if the current name is not the value of
           any t11ZsZoneMemberID in the same Zone Set database."
    ::= { t11ZsAliasEntry 2 }

t11ZsAliasRowStatus OBJECT-TYPE
    SYNTAX       RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The status of this conceptual row.

           This object cannot be set to 'active' unless the
           corresponding value of t11ZsAliasName is unique within
           the Fabric's Zone Server database on this switch."
    ::= { t11ZsAliasEntry 3 }

--
-- The table of Zone Members
--

t11ZsZoneMemberTable  OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsZoneMemberEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This table contains all members of a Zone/Zone Alias
           and information about those members in the Zone Set
           database of the Zone Servers on each Fabric in one or
           more switches.

           In Enhanced mode, changes to a database made via this
           table are always made to the 'copy' database, but
           values read from this table reflect the contents of
           either the 'copy' database or the current (committed)
           database as indicated by the corresponding value of
           t11ZsServerReadFromDatabase."
    ::= { t11ZsConfiguration 6 }

t11ZsZoneMemberEntry OBJECT-TYPE
    SYNTAX       T11ZsZoneMemberEntry
    MAX-ACCESS   not-accessible
```

```
    STATUS       current
    DESCRIPTION
           "Each entry represents the relationship between a
           member and (one of) its 'parent(s)', i.e., a Zone
           or Zone Alias to which the member belongs, within
           a particular Fabric (identified by the value of
           t11ZsServerFabricIndex) on a particular switch
           (identified by values of fcmInstanceIndex and
           fcmSwitchIndex).

           A Zone member (other than an alias) is added to a
           Zone by creating an entry in this table having:

            - t11ZsZoneMemberParentType = 'zone',  and
            - t11ZsZoneMemberParentIndex = Zone's t11ZsZoneIndex,
            - t11ZsZoneMemberFormat != '05 - Alias Name',
            - t11ZsZoneMemberID = Member's identifier.

           An 'active' row in this table references rows in other
           tables.  The agent must ensure that all such referenced
           rows exist with a status of 'active', either by refusing to
           create new active rows in this table, or by automatically
           deleting any rows in this table that reference a deleted
           row.

           The StorageType of a row in this table is specified by
           the instance of t11ZsServerDatabaseStorageType that is
           INDEXed by the same values of fcmInstanceIndex,
           fcmSwitchIndex, and t11ZsServerFabricIndex."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex, t11ZsZoneMemberParentType,
              t11ZsZoneMemberParentIndex, t11ZsZoneMemberIndex }
    ::= { t11ZsZoneMemberTable 1 }

T11ZsZoneMemberEntry ::= SEQUENCE {
    t11ZsZoneMemberParentType        INTEGER,
    t11ZsZoneMemberParentIndex       Unsigned32,
    t11ZsZoneMemberIndex             Unsigned32,
    t11ZsZoneMemberFormat            T11ZsZoneMemberType,
    t11ZsZoneMemberID                OCTET STRING,
    t11ZsZoneMemberRowStatus         RowStatus
}

t11ZsZoneMemberParentType  OBJECT-TYPE
    SYNTAX       INTEGER {
                     zone(1), -- member belongs to a Zone
                     alias(2) -- member belongs to a Zone Alias
                 }
```

```
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This object determines whether this member belongs
           to a Zone or Zone Alias."
    ::= { t11ZsZoneMemberEntry 1 }

t11ZsZoneMemberParentIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This object contains the index value of the Zone or
           Zone Alias to which this member belongs.

           If the value of the corresponding instance of
           t11ZsZoneMemberParentType is 'zone', then this object
           will contain the value of the t11ZsZoneIndex object of
           the Zone to which this member belongs.

           If the value of the corresponding instance of
           t11ZsZoneMemberParentType is 'alias', then this object
           will contain the value of the t11ZsAliasIndex object
           of the Zone Alias to which this member belongs."
    ::= { t11ZsZoneMemberEntry 2 }

t11ZsZoneMemberIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "An index value that uniquely identifies this Zone
           Member amongst all Zone Members in the Zone Set
           database of a particular Fabric on a particular switch."
    ::= { t11ZsZoneMemberEntry 3 }

t11ZsZoneMemberFormat OBJECT-TYPE
    SYNTAX       T11ZsZoneMemberType
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "This object identifies the format of the
           Zone/Zone Alias member's identifier contained in
           t11ZsZoneMemberID.

           This object cannot be modified while the corresponding
           value of t11ZsZoneMemberRowStatus object is 'active'."
    ::= { t11ZsZoneMemberEntry 4 }
```

```
t11ZsZoneMemberID OBJECT-TYPE
    SYNTAX       OCTET STRING (SIZE (1..255))
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "This object contains the Member Identifier of the
           Zone or Alias.  The interpretation of this object
           depends on the value of the corresponding instance
           of t11ZsZoneMemberFormat:

             - if t11ZsZoneMemberFormat is 'N_Port_Name', then
               this object contains an N_Port_Name.

             - if t11ZsZoneMemberFormat is 'Domain_ID and physical
               port', then this object contains a 4-octet value in
               network byte order.  The first octet is zero,
               the second octet contains the Domain_ID, and the
               last 2 octets contain the physical port number.

             - if t11ZsZoneMemberFormat is 'N_Port_ID', then this
               object contains the 3-octet Nx_Port FC_ID.

             - if t11ZsZoneMemberFormat is 'Alias Name', then
               this object contains the value of t11ZsAliasName
               for some Alias in the same Zone Set database.

             - if t11ZsZoneMemberFormat is 'Node_Name', then
               this object contains an 8-octet Node_Name.

             - if t11ZsZoneMemberFormat is 'F_Port_Name', then
               this object contains an 8-octet F_Port_Name.

             - if t11ZsZoneMemberFormat is one of the 'Vendor
               Specific' values, then this object contains a value
               of 1 to 255 octets in a format defined by the relevant
               vendor.

           This object cannot be modified while the corresponding
           value of t11ZsZoneMemberRowStatus object is 'active'."
    ::= { t11ZsZoneMemberEntry 5 }

t11ZsZoneMemberRowStatus OBJECT-TYPE
    SYNTAX       RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The status of this conceptual row.
```

```
            The corresponding instances of t11ZsZoneMemberID and
            t11ZsZoneMemberFormat objects must be set before or
            concurrently with setting this object to 'active'."
    ::= { t11ZsZoneMemberEntry 6 }

--
-- The table of Zone Attribute Blocks
--

t11ZsAttribBlockTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsAttribBlockEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "This table gives information on all the Zone
            Attributes in the Zone Set database of the Zone
            Servers on each Fabric in one or more switches.

            In Enhanced mode, changes to a database made via this
            table are always made to the 'copy' database, but
            values read from this table reflect the contents of
            either the 'copy' database or the current (committed)
            database as indicated by the corresponding value of
            t11ZsServerReadFromDatabase."
    ::= { t11ZsConfiguration 7 }

t11ZsAttribBlockEntry OBJECT-TYPE
    SYNTAX       T11ZsAttribBlockEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each entry contains information about a Zone Attribute
            Block (of Zone Attributes) in the Zone Set database
            of a particular Fabric (identified by the value of
            t11ZsServerFabricIndex) on a particular switch
            (identified by values of fcmInstanceIndex and
            fcmSwitchIndex).

            An 'active' row in this table references a row in the
            t11ZsAttribBlockTable.  The agent must ensure that the
            referenced rows exists with a status of 'active', either by
            refusing to create new active rows in this table, or by
            automatically deleting any rows in this table that
            reference a deleted row.

            The StorageType of a row in this table is specified by
            the instance of t11ZsServerDatabaseStorageType that is
            INDEXed by the same values of fcmInstanceIndex,
```

```
            fcmSwitchIndex, and t11ZsServerFabricIndex."
        INDEX   { fcmInstanceIndex, fcmSwitchIndex,
                  t11ZsServerFabricIndex, t11ZsAttribBlockIndex }
        ::= { t11ZsAttribBlockTable 1 }

T11ZsAttribBlockEntry ::= SEQUENCE {
        t11ZsAttribBlockIndex         Unsigned32,
        t11ZsAttribBlockName          T11ZoningName,
        t11ZsAttribBlockRowStatus     RowStatus
}

t11ZsAttribBlockIndex OBJECT-TYPE
        SYNTAX       Unsigned32 (1..4294967295)
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
               "An index value that uniquely identifies this Zone
               Attribute within the Zone Set database of a particular
               Fabric on a particular switch."
        ::= { t11ZsAttribBlockEntry 1 }

t11ZsAttribBlockName OBJECT-TYPE
        SYNTAX       T11ZoningName
        MAX-ACCESS   read-create
        STATUS       current
        DESCRIPTION
               "The name of this Zone Attribute Block, which should
               be unique within the Fabric."
        ::= { t11ZsAttribBlockEntry 2 }

t11ZsAttribBlockRowStatus OBJECT-TYPE
        SYNTAX       RowStatus
        MAX-ACCESS   read-create
        STATUS       current
        DESCRIPTION
               "The status of this conceptual row."
        ::= { t11ZsAttribBlockEntry 3 }
```

```
--
-- The table of Zone Attributes
--

t11ZsAttribTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsAttribEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This table gives information on the Zone Attributes
           within the Zone Attribute Blocks in the Zone Set
           database of the Zone Servers on each Fabric in one
           or more switches.

           In Enhanced mode, changes to a database made via this
           table are always made to the 'copy' database, but
           values read from this table reflect the contents of
           either the 'copy' database or the current (committed)
           database as indicated by the corresponding value of
           t11ZsServerReadFromDatabase."
    ::= { t11ZsConfiguration 8 }

t11ZsAttribEntry OBJECT-TYPE
    SYNTAX       T11ZsAttribEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry contains information about a Zone
           Attribute in a Zone Attribute Block (identified by
           t11ZsAttribBlockIndex) in the Zone Set database of
           a particular Fabric (identified by the value of
           t11ZsServerFabricIndex) on a particular switch
           (identified by values of fcmInstanceIndex and
           fcmSwitchIndex).

           An entry in this table cannot be created prior to
           its associated entry in the t11ZsAttribBlockTable.

           The StorageType of a row in this table is specified by
           the instance of t11ZsServerDatabaseStorageType that is
           INDEXed by the same values of fcmInstanceIndex,
           fcmSwitchIndex, and t11ZsServerFabricIndex."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex,
              t11ZsAttribBlockIndex, t11ZsAttribIndex }
    ::= { t11ZsAttribTable 1 }

T11ZsAttribEntry ::= SEQUENCE {
```

```
    t11ZsAttribIndex            Unsigned32,
    t11ZsAttribType             Unsigned32,
    t11ZsAttribValue            OCTET STRING,
    t11ZsAttribRowStatus        RowStatus
}

t11ZsAttribIndex OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "An index value that uniquely identifies this
           Zone Attribute within its Zone Attribute Block in
           the Zone Set database of a particular Fabric on a
           particular switch."
    ::= { t11ZsAttribEntry 1 }

t11ZsAttribType  OBJECT-TYPE
    SYNTAX       Unsigned32 (0..65535)
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The type of attribute:

                0001       - Protocol
                0002       - Broadcast Zone
                0003       - Hard Zone
                00E0 (hex) - Vendor Specific."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.8.3.8, Table 249."
    ::= { t11ZsAttribEntry 2 }

t11ZsAttribValue  OBJECT-TYPE
    SYNTAX       OCTET STRING (SIZE (4..252))
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The value of the attribute, formatted as specified
           in FC-GS-5 for the type given by the corresponding
           instance of t11ZsAttribType.

           Note that FC-GS-5 requires that the length of this
           value is a multiple of 4 bytes."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.8.3.8."
    ::= { t11ZsAttribEntry 3 }
```

```
t11ZsAttribRowStatus OBJECT-TYPE
    SYNTAX       RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
           "The status of this conceptual row."
    ::= { t11ZsAttribEntry 4 }

--
-- Activating a Zone Set
--

t11ZsActivateTable  OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsActivateEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This table provides a mechanism to allow a Zone Set
           to be activated on a Fabric."
    ::= { t11ZsConfiguration 9 }

t11ZsActivateEntry OBJECT-TYPE
    SYNTAX       T11ZsActivateEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry reflects the state of the activation of a
           Zone Set by a particular switch (identified by values
           of fcmInstanceIndex and fcmSwitchIndex) on a particular
           Fabric (identified by the value of
           t11ZsServerFabricIndex)."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex }
    ::= { t11ZsActivateTable 1 }

T11ZsActivateEntry ::= SEQUENCE {
    t11ZsActivateRequest       Unsigned32,
    t11ZsActivateDeactivate    INTEGER,
    t11ZsActivateResult        INTEGER,
    t11ZsActivateFailCause     SnmpAdminString,
    t11ZsActivateFailDomainId  FcDomainIdOrZero
}

t11ZsActivateRequest OBJECT-TYPE
    SYNTAX       Unsigned32 (0..4294967295)
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
```

```
            "Setting this object to a value is a request for a
            Zone Set to be activated on the Fabric that is
            represented by this row.  The Zone Set to be
            activated is the one for which t11ZsSetIndex has
            the same value.

            If a Zone Set is already active on a Fabric when a
            request is made to activate a different one on that
            Fabric, then the existing Zone Set is automatically
            deactivated and the specified Zone Set is activated
            in its place.

            The value of this object when read is always 0."
    ::= { t11ZsActivateEntry 1 }

t11ZsActivateDeactivate OBJECT-TYPE
    SYNTAX       INTEGER {
                     deactivate(1),
                     noop(2)
                 }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
            "Setting this object to 'deactivate' is a request
            to deactivate the currently active Zone Set on
            a Fabric.

            Note that the deactivation of the active Zone Set
            allows all ports to communicate or no ports to
            communicate, depending on the current Default Zone
            behavior.

            No action is taken if this object is set to 'noop'.
            When read, the value of this object is always 'noop'."
    ::= { t11ZsActivateEntry 2 }

t11ZsActivateResult OBJECT-TYPE
    SYNTAX       INTEGER {
                     activateSuccess(1),
                     activateFailure(2),
                     deactivateSuccess(3),
                     deactivateFailure(4),
                     inProgress(5),
                     none(6)
                 }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
```

```
            "This object indicates the outcome of the most recent
            activation/deactivation using this entry.

            When the value of this object is 'inProgress', the
            values of the corresponding instances of
            t11ZsActivateRequest and t11ZsActivateDeactivate
            cannot be modified.

            The value 'none' indicates activation/deactivation
            has not been attempted since the last restart of
            the management system."
    ::= { t11ZsActivateEntry 3 }

t11ZsActivateFailCause OBJECT-TYPE
    SYNTAX       SnmpAdminString (SIZE (0..64))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "A textual message indicating the reason for the
            most recent failure of a Zone Set activation or
            deactivation, or the zero-length string if no
            information is available (e.g., because the
            corresponding instance of t11ZsActivateResult
            has the value 'none').

            When the corresponding instance of
            t11ZsActivateResult is either 'activateFailure'
            or 'deactivateFailure', the value of this object
            indicates the reason for that failure."
    ::= { t11ZsActivateEntry 4 }

t11ZsActivateFailDomainId OBJECT-TYPE
    SYNTAX       FcDomainIdOrZero
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "If the failure cause (as indicated by
            t11ZsSetFailCause) was specific to a particular
            device, this object contains the Domain_ID of that
            device.  Otherwise, this object contains zero."
    ::= { t11ZsActivateEntry 5 }
```

```
--
-- t11ZsActiveTable
--

t11ZsActiveTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsActiveEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A table containing information on the currently
           enforced/active Zone Set on each Fabric.
           An active Zone Set cannot be modified.
           This table will be empty when no Zone Set is
           activated."
    ::= { t11ZsConfiguration 10 }

t11ZsActiveEntry OBJECT-TYPE
    SYNTAX       T11ZsActiveEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry represents an active Zone Set of a
           particular Fabric (identified by the value of
           t11ZsServerFabricIndex), according to a particular
           switch (identified by values of fcmInstanceIndex and
           fcmSwitchIndex)."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex }
    ::= { t11ZsActiveTable 1 }

T11ZsActiveEntry ::= SEQUENCE {
    t11ZsActiveZoneSetName    T11ZoningName,
    t11ZsActiveActivateTime   TimeStamp
}

t11ZsActiveZoneSetName OBJECT-TYPE
    SYNTAX       T11ZoningName
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "The name of this Zone Set on this Fabric."
    ::= { t11ZsActiveEntry 1 }

t11ZsActiveActivateTime OBJECT-TYPE
    SYNTAX       TimeStamp
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
```

```
            "The value of sysUpTime at which this entry was most
            recently activated.  If this row was activated prior to
            the last re-initialization of the local network management
            system, then this object will contain a zero value."
    ::= { t11ZsActiveEntry 2 }

--
-- Zones in the Active/Enforced Zone Set
--

t11ZsActiveZoneTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsActiveZoneEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "This table contains all the Zones that are present in
            the active Zone Sets on all Fabrics."
    ::= { t11ZsConfiguration 11 }

t11ZsActiveZoneEntry OBJECT-TYPE
    SYNTAX       T11ZsActiveZoneEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each entry represents a Zone in the active Zone Set
            of a particular Fabric (identified by the value of
            t11ZsServerFabricIndex), according to a particular
            switch (identified by values of fcmInstanceIndex and
            fcmSwitchIndex)."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex, t11ZsActiveZoneIndex }
    ::= { t11ZsActiveZoneTable 1 }

T11ZsActiveZoneEntry ::= SEQUENCE {
    t11ZsActiveZoneIndex           Unsigned32,
    t11ZsActiveZoneName            T11ZoningName,
    t11ZsActiveZoneBroadcastZoning TruthValue,
    t11ZsActiveZoneHardZoning      TruthValue
}

t11ZsActiveZoneIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "An index value that uniquely identifies this Zone
            within the active Zone Set on a particular Fabric."
    ::= { t11ZsActiveZoneEntry 1 }
```

```
t11ZsActiveZoneName OBJECT-TYPE
    SYNTAX       T11ZoningName
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "The name of this Zone."
    ::= { t11ZsActiveZoneEntry 2 }

t11ZsActiveZoneBroadcastZoning OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "This object indicates whether broadcast Zoning is
           enabled on this Zone.  If broadcast Zoning is enabled,
           then broadcast frames generated by a member in this
           Zone will be restricted to members in this Zone.

           This object is only instantiated in Enhanced mode."
    ::= { t11ZsActiveZoneEntry 3 }

t11ZsActiveZoneHardZoning OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "This object indicates whether hard Zoning is
           enabled on this Zone.

           This object is only instantiated in Enhanced mode."
    ::= { t11ZsActiveZoneEntry 4 }

--
-- Zone Members in the Active/Enforced Zone Set
--

t11ZsActiveZoneMemberTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsActiveZoneMemberEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This table contains all members of all Zones
           within the active Zone Set on any Fabric."
    ::= { t11ZsConfiguration 12 }

t11ZsActiveZoneMemberEntry OBJECT-TYPE
    SYNTAX       T11ZsActiveZoneMemberEntry
    MAX-ACCESS   not-accessible
```

```
    STATUS       current
    DESCRIPTION
           "Each entry represents a member of a Zone in the active
           Zone Set of a particular Fabric (identified by the value
           t11ZsServerFabricIndex), according to a particular
           switch (identified by values of fcmInstanceIndex and
           fcmSwitchIndex)."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex,
              t11ZsActiveZoneIndex, t11ZsActiveZoneMemberIndex }
    ::= { t11ZsActiveZoneMemberTable 1 }

T11ZsActiveZoneMemberEntry ::= SEQUENCE {
    t11ZsActiveZoneMemberIndex      Unsigned32,
    t11ZsActiveZoneMemberFormat     T11ZsZoneMemberType,
    t11ZsActiveZoneMemberID         OCTET STRING
}

t11ZsActiveZoneMemberIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "An index value that uniquely identifies this
           member amongst the members of a particular Zone
           in the active Zone Set on a particular Fabric."
    ::= { t11ZsActiveZoneMemberEntry 1 }

t11ZsActiveZoneMemberFormat OBJECT-TYPE
    SYNTAX       T11ZsZoneMemberType
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "This object identifies the identifier format of the
           corresponding instance of t11ZsActiveZoneMemberID."
    ::= { t11ZsActiveZoneMemberEntry 2 }

t11ZsActiveZoneMemberID OBJECT-TYPE
    SYNTAX       OCTET STRING (SIZE (1..255))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "This value of this object identifies the member
           using the format specified in the corresponding
           instance of t11ZsActiveZoneMemberFormat."
    ::= { t11ZsActiveZoneMemberEntry 3 }
```

```
--
-- Zone Attributes in the Active/Enforced Zone Set
--

t11ZsActiveAttribTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsActiveAttribEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "This table contains information about some of the
           Attributes of the Zones within the active Zone Set
           on each Fabric.

           This table contains all the types of attributes
           that might apply zero, one, or more times to a Zone.
           Attributes that apply once and only to a Zone are
           specified in the t11ZsActiveZoneTable.

           This table will always be empty in Basic mode.
           It will also be empty if there are no Zones in
           any active Zone Set having any of the applicable
           types of attributes."
    ::= { t11ZsConfiguration 13 }

t11ZsActiveAttribEntry OBJECT-TYPE
    SYNTAX       T11ZsActiveAttribEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry contains an Attribute of a particular
           Zone in the active Zone Set of a particular Fabric
           (identified by the value of t11ZsServerFabricIndex),
           according to a particular switch (identified by
           values of fcmInstanceIndex and fcmSwitchIndex)."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex,
              t11ZsActiveZoneIndex, t11ZsActiveAttribIndex }
    ::= { t11ZsActiveAttribTable 1 }

T11ZsActiveAttribEntry ::= SEQUENCE {
    t11ZsActiveAttribIndex        Unsigned32,
    t11ZsActiveAttribType         Unsigned32,
    t11ZsActiveAttribValue        OCTET STRING
}

t11ZsActiveAttribIndex  OBJECT-TYPE
    SYNTAX       Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
```

```
    STATUS       current
    DESCRIPTION
           "An index value that uniquely identifies this
           attribute amongst the other attributes for a
           particular Zone in the active Zone Set on a
           particular Fabric."
    ::= { t11ZsActiveAttribEntry 1 }

t11ZsActiveAttribType  OBJECT-TYPE
    SYNTAX       Unsigned32 (0..65535)
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "The type of attribute:

                0001       - Protocol
                00E0 (hex) - Vendor Specific

           Note that type 2 (Hard) and type 3 (Broadcast)
           do not need to be represented here, because they
           are represented by t11ZsActiveZoneBroadcastZoning and
           t11ZsActiveZoneHardZoning."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.8.3.8, Table 249."
    ::= { t11ZsActiveAttribEntry 2 }

t11ZsActiveAttribValue  OBJECT-TYPE
    SYNTAX       OCTET STRING (SIZE (0..252))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "The value of the attribute, formatted according to
           its type as indicated by the corresponding instance
           of t11ZsActiveAttribType.

           As specified in FC-GS-5, the length of an attribute
           value is at least 4 bytes, and if necessary, the value
           is appended with zero bytes so that the length is a
           multiple of 4.  For a Vendor-Specific attribute
           value, the first 8 bytes contain the T10 Vendor ID
           as described in FC-GS-5."
    REFERENCE
           "Fibre Channel - Generic Services-5 (FC-GS-5),
           ANSI INCITS 427-2007, section 6.4.8.3.8."
    ::= { t11ZsActiveAttribEntry 3 }
```

```
--
-- Zone Server Statistics
--

t11ZsStatsTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsStatsEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A table of statistics maintained by Zone Servers."
    ::= { t11ZsStatistics 1 }

t11ZsStatsEntry OBJECT-TYPE
    SYNTAX       T11ZsStatsEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A set of statistics for a Zone Server on a
           particular Fabric (identified by the value of
           t11ZsServerFabricIndex) on a particular switch
           (identified by values of fcmInstanceIndex and
           fcmSwitchIndex)."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex }
    ::= { t11ZsStatsTable 1 }

T11ZsStatsEntry ::= SEQUENCE {
    t11ZsOutMergeRequests     Counter32,
    t11ZsInMergeAccepts       Counter32,
    t11ZsInMergeRequests      Counter32,
    t11ZsOutMergeAccepts      Counter32,
    t11ZsOutChangeRequests    Counter32,
    t11ZsInChangeAccepts      Counter32,
    t11ZsInChangeRequests     Counter32,
    t11ZsOutChangeAccepts     Counter32,
    t11ZsInZsRequests         Counter32,
    t11ZsOutZsRejects         Counter32
}

t11ZsOutMergeRequests OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "The number of Merge Request Frames sent by this Zone
           Server to other Zone Servers in the same Fabric.

           This counter has no discontinuities other than those
```

```
            that all Counter32s have when sysUpTime=0."
    ::= { t11ZsStatsEntry 1 }

t11ZsInMergeAccepts OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The number of Merge Accept Frames received by this Zone
            Server from other Zone Servers in the same Fabric.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11ZsStatsEntry 2 }

t11ZsInMergeRequests OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The number of Merge Request Frames received by this Zone
            Server from other Zone Servers in the same Fabric.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11ZsStatsEntry 3 }

t11ZsOutMergeAccepts OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The number of Merge Accept Frames sent by this Zone
            Server to other Zone Servers in the same Fabric.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11ZsStatsEntry 4 }

t11ZsOutChangeRequests OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The number of change requests sent (via the Fabric
            Management Session Protocol) by this Zone Server to
            other Zone Servers in the same Fabric.
```

```
            This includes Acquire Change Authorization requests, Stage
            Fabric Config Update requests, Update Fabric Config requests
            and Release Change Authorization requests.  It also includes
            the corresponding types of requests defined by the Enhanced
            Commit Service.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, sections 10.6 and 13."
    ::= { t11ZsStatsEntry 5 }

t11ZsInChangeAccepts OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The number of SW_ACC messages received from other Zone
            Servers in the same Fabric (according to the Fabric
            Management Session Protocol) in response to change
            requests by this Zone Server.

            This includes SW_ACC messages received in response to
            Acquire Change Authorization requests, to Stage Fabric
            Config Update requests, to Update Fabric Config requests,
            and to Release Change Authorization requests.  It also
            includes responses to the corresponding types of requests
            defined for the Enhanced Commit Service.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, sections 10.6 and 13."
    ::= { t11ZsStatsEntry 6 }

t11ZsInChangeRequests OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The number of change requests received (via the Fabric
            Management Session Protocol) by this Zone Server from
            other Zone Servers in the same Fabric.

            This includes Acquire Change Authorization requests, Stage
            Fabric Config Update requests, Update Fabric Config requests
```

```
            and Release Change Authorization requests.  It also includes
            the corresponding types of requests defined by the Enhanced
            Commit Service.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
        REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, sections 10.6 and 13."
        ::= { t11ZsStatsEntry 7 }

    t11ZsOutChangeAccepts OBJECT-TYPE
        SYNTAX       Counter32
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The number of SW_ACC messages sent by this Zone Server
            (according to the Fabric Management Session Protocol) in
            response to change requests from other Zone Servers in
            the same Fabric.

            This includes SW_ACC messages sent in response to
            Acquire Change Authorization requests, to Stage Fabric
            Config Update requests, to Update Fabric Config requests
            and to Release Change Authorization requests.  It also
            includes responses to the corresponding types of requests
            defined for the Enhanced Commit Service.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
        REFERENCE
            "Fibre Channel - Switch Fabric-4 (FC-SW-4),
            ANSI INCITS 418-2006, April 2006, sections 10.6 and 13."
        ::= { t11ZsStatsEntry 8 }

    t11ZsInZsRequests OBJECT-TYPE
        SYNTAX       Counter32
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The number of Zone Server requests received by this
            Zone Server on this Fabric, both those received in
            Basic mode and in Enhanced mode.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
        ::= { t11ZsStatsEntry 9 }
```

```
t11ZsOutZsRejects OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
           "The number of Zone Server requests rejected by this
           Zone Server on this Fabric, both those rejected in
           Basic mode and in Enhanced mode.

           This counter has no discontinuities other than those
           that all Counter32s have when sysUpTime=0."
    ::= { t11ZsStatsEntry 10 }

--
-- Notification Control Table
--

t11ZsNotifyControlTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF T11ZsNotifyControlEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "A table of control information for notifications
           generated due to Zone Server events."
    ::= { t11ZsConfiguration 14 }

t11ZsNotifyControlEntry OBJECT-TYPE
    SYNTAX       T11ZsNotifyControlEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
           "Each entry contains notification control information
           specific to a Zone Server for a particular Fabric
           (identified by the value of t11ZsServerFabricIndex)
           on a particular switch (identified by values of
           fcmInstanceIndex and fcmSwitchIndex).

           The persistence across reboots of writable values in
           a row of this table is specified by the instance of
           t11ZsServerDatabaseStorageType that is INDEXed by
           the same values of fcmInstanceIndex, fcmSwitchIndex,
           and t11ZsServerFabricIndex."
    INDEX   { fcmInstanceIndex, fcmSwitchIndex,
              t11ZsServerFabricIndex }
    ::= { t11ZsNotifyControlTable 1 }

T11ZsNotifyControlEntry ::= SEQUENCE {
     t11ZsNotifyRequestRejectEnable    TruthValue,
```

```
     t11ZsNotifyMergeFailureEnable     TruthValue,
     t11ZsNotifyMergeSuccessEnable     TruthValue,
     t11ZsNotifyDefZoneChangeEnable    TruthValue,
     t11ZsNotifyActivateEnable         TruthValue,
     t11ZsRejectCtCommandString        OCTET STRING,
     t11ZsRejectRequestSource          FcNameIdOrZero,
     t11ZsRejectReasonCode             T11NsGs4RejectReasonCode,
     t11ZsRejectReasonCodeExp          T11ZsRejectReasonExplanation,
     t11ZsRejectReasonVendorCode       OCTET STRING
}

t11ZsNotifyRequestRejectEnable OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
           "This object specifies whether t11ZsRequestRejectNotify
           notifications should be generated by the Zone Server
           for this Fabric."
    ::= { t11ZsNotifyControlEntry 1 }

t11ZsNotifyMergeFailureEnable OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
           "This object specifies whether t11ZsMergeFailureNotify
           notifications should be generated by the Zone Server
           for this Fabric."
    ::= { t11ZsNotifyControlEntry 2 }

t11ZsNotifyMergeSuccessEnable OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
           "This object specifies whether t11ZsMergeSuccessNotify
           notifications should be generated by the Zone Server
           for this Fabric."
    ::= { t11ZsNotifyControlEntry 3 }

t11ZsNotifyDefZoneChangeEnable OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
           "This object specifies whether t11ZsDefZoneChangeNotify
           notifications should be generated by the Zone Server
```

```
            for this Fabric."
    ::= { t11ZsNotifyControlEntry 4 }

t11ZsNotifyActivateEnable OBJECT-TYPE
    SYNTAX       TruthValue
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
            "This object specifies whether t11ZsActivateNotify
            notifications should be generated by the Zone Server
            for this Fabric."
    ::= { t11ZsNotifyControlEntry 5 }

t11ZsRejectCtCommandString OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0..255))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The binary content of the Zone Server request,
            formatted as an octet string (in network byte order)
            containing the Common Transport Information Unit
            (CT_IU), as described in Table 2 of FC-GS-5 (including
            the preamble), which was most recently rejected by the
            Fabric Configuration Server for this Fabric.

            This object contains the zero-length string
            if and when the CT-IU's content is unavailable.

            When the length of this object is 255 octets, it
            contains the first 255 octets of the CT-IU (in
            network byte order)."
    ::= { t11ZsNotifyControlEntry 6 }

t11ZsRejectRequestSource OBJECT-TYPE
    SYNTAX       FcNameIdOrZero
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The WWN that was the source of the CT_IU
            contained in the corresponding instance of
            t11ZsRejectCtCommandString."
    ::= { t11ZsNotifyControlEntry 7 }

t11ZsRejectReasonCode OBJECT-TYPE
    SYNTAX       T11NsGs4RejectReasonCode
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
```

```
            "The reason code corresponding to the most recent
            rejection of a request by the Zone Server for
            this Fabric."
    ::= { t11ZsNotifyControlEntry 8 }

t11ZsRejectReasonCodeExp OBJECT-TYPE
    SYNTAX       T11ZsRejectReasonExplanation
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "When the value of t11ZsRejectReasonCode is
            'Unable to perform command request', this
            object contains the corresponding reason code
            explanation."
    ::= { t11ZsNotifyControlEntry 9 }

t11ZsRejectReasonVendorCode       OBJECT-TYPE
    SYNTAX       OCTET STRING (SIZE (1))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "When the value of t11ZsRejectReasonCode is
            'Vendor Specific Error', this object contains
            the corresponding vendor-specific reason code."
    ::= { t11ZsNotifyControlEntry 10 }

t11ZsFabricIndex OBJECT-TYPE
    SYNTAX       Unsigned32 (0..4096)
    MAX-ACCESS   accessible-for-notify
    STATUS       current
    DESCRIPTION
            "This object contains either a value of
            T11FabricIndex to identify the Fabric on which
            some occurrence has caused a notification to be
            generated, or it has the value 4096 to indicate
            all applicable Fabrics."
    ::= { t11ZsConfiguration 15 }
```

```
-- Notifications

t11ZsRequestRejectNotify NOTIFICATION-TYPE
    OBJECTS      { t11FamLocalSwitchWwn,
                   t11ZsRejectRequestSource,
                   t11ZsRejectCtCommandString,
                   t11ZsRejectReasonCode,
                   t11ZsRejectReasonCodeExp,
                   t11ZsRejectReasonVendorCode }
    STATUS       current
    DESCRIPTION
           "This notification is generated whenever a Zone Server
           (indicated by the value of t11FamLocalSwitchWwn) rejects
           a request.

           The value of t11ZsRejectCtCommandString indicates the
           rejected request, and the values of t11ZsRejectReasonCode,
           t11ZsRejectReasonCodeExp and t11ZsRejectReasonVendorCode
           indicate the reason for the rejection.  The value of
           t11ZsRequestClient indicates the source of the request."
    ::= { t11ZsMIBNotifications 1 }

t11ZsMergeFailureNotify NOTIFICATION-TYPE
    OBJECTS      { ifIndex, t11ZsFabricIndex }
    STATUS       current
    DESCRIPTION
           "This notification indicates that a Zone merge
           failure has occurred on the Fabric indicated by the
           value of t11ZsFabricIndex, on the interface
           indicated by the value of ifIndex.

           If multiple Virtual Fabrics are configured on an
           interface, and all have a Zone merge failure
           at the same time, then just one notification is
           generated and t11ZsFabricIndex has the value 4096."
    ::= { t11ZsMIBNotifications 2 }

t11ZsMergeSuccessNotify NOTIFICATION-TYPE
    OBJECTS      { ifIndex, t11ZsFabricIndex }
    STATUS       current
    DESCRIPTION
           "This notification indicates that a successful Zone
           merge has occurred on the Fabric indicated by the
           value of t11ZsFabricIndex, on the interface
           indicated by the value of ifIndex.

           If multiple Virtual Fabrics are configured on an
           interface, and all have a successful Zone Merge
```

```
            at the same time, then just one notification is
            generated and t11ZsFabricIndex has the value 4096."
    ::= { t11ZsMIBNotifications 3 }

t11ZsDefZoneChangeNotify NOTIFICATION-TYPE
    OBJECTS      { t11ZsServerDefaultZoneSetting }
    STATUS       current
    DESCRIPTION
            "This notification indicates that the
            value of a Default Zone Setting has changed.
            The value of t11ZsServerDefaultZoneSetting
            contains the value after the change."
    ::= { t11ZsMIBNotifications 4 }

t11ZsActivateNotify NOTIFICATION-TYPE
    OBJECTS      { t11FamLocalSwitchWwn, t11ZsActivateResult }
    STATUS       current
    DESCRIPTION
            "This notification is generated whenever a switch
            (indicated by the value of t11FamLocalSwitchWwn)
            activates/deactivates a Zone Set on a Fabric.
            The t11ZsActivateResult object denotes the outcome
            of the activation/deactivation."
    ::= { t11ZsMIBNotifications 5 }

-- Conformance

t11ZsMIBCompliances OBJECT IDENTIFIER ::= { t11ZsMIBConformance 1 }
t11ZsMIBGroups      OBJECT IDENTIFIER ::= { t11ZsMIBConformance 2 }

t11ZsMIBCompliance MODULE-COMPLIANCE
    STATUS       current
    DESCRIPTION
            "The compliance statement for entities that
            implement the Zone Server."
    MODULE MANDATORY-GROUPS {t11ZsBasicGroup,
                             t11ZsNotificationControlGroup,
                             t11ZsNotificationGroup }

    GROUP        t11ZsEnhancedModeGroup
    DESCRIPTION
            "This group is mandatory only for those systems
            with Zone Servers that support Enhanced Mode."

    GROUP        t11ZsActivateGroup
    DESCRIPTION
            "Only entities that provide write access for
            activating a Zone Set support need to support
```

```
            this group."

        GROUP        t11ZsStatisticsGroup
        DESCRIPTION
               "These counters, containing Zone Server statistics,
               are mandatory only for those systems that count
               such events."

        OBJECT       t11ZsSetRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
               "Write access is not required."

        OBJECT       t11ZsZoneRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
               "Write access is not required."

        OBJECT       t11ZsSetZoneRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
               "Write access is not required."

        OBJECT       t11ZsAliasRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
               "Write access is not required."

        OBJECT       t11ZsZoneMemberRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
               "Write access is not required."

        OBJECT       t11ZsAttribBlockRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
               "Write access is not required."

        OBJECT       t11ZsAttribRowStatus
        SYNTAX       INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
```

```
            "Write access is not required."

        OBJECT       t11ZsServerDatabaseStorageType
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerDistribute
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerCommit
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerReadFromDatabase
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerOperationMode
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerDefaultZoneSetting
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerMergeControlSetting
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsServerDefZoneBroadcast
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsSetName
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT       t11ZsZoneName
```

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

    OBJECT       t11ZsZoneAttribBlock
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsAliasName
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsZoneMemberFormat
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsZoneMemberID
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsAttribBlockName
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsAttribType
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsAttribValue
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsActivateRequest
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsActivateDeactivate
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."
```

```
    OBJECT       t11ZsNotifyRequestRejectEnable
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsNotifyMergeFailureEnable
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsNotifyMergeSuccessEnable
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsNotifyDefZoneChangeEnable
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    OBJECT       t11ZsNotifyActivateEnable
    MIN-ACCESS   read-only
    DESCRIPTION
           "Write access is not required."

    ::= { t11ZsMIBCompliances 1 }

-- Units of Conformance

t11ZsBasicGroup OBJECT-GROUP
    OBJECTS  { t11ZsServerCapabilityObject,
               t11ZsServerDatabaseStorageType,
               t11ZsServerDistribute,
               t11ZsServerResult,
               t11ZsServerReasonCode,
               t11ZsServerReasonCodeExp,
               t11ZsServerReasonVendorCode,
               t11ZsServerLastChange,
               t11ZsServerHardZoning,
               t11ZsServerReadFromDatabase,
               t11ZsServerOperationMode,
               t11ZsSetName,
               t11ZsSetRowStatus,
               t11ZsZoneName,
               t11ZsZoneAttribBlock,
               t11ZsZoneRowStatus,
               t11ZsSetZoneRowStatus,
               t11ZsZoneMemberFormat,
```

```
                t11ZsZoneMemberID,
                t11ZsZoneMemberRowStatus,
                t11ZsActiveZoneSetName,
                t11ZsActiveActivateTime,
                t11ZsActiveZoneName,
                t11ZsActiveZoneMemberFormat,
                t11ZsActiveZoneMemberID
              }
    STATUS   current
    DESCRIPTION
           "A collection of objects for displaying and updating
           the Zone configuration of a Zone Server capable of
           operating in Basic mode."
    ::= { t11ZsMIBGroups 1 }

t11ZsEnhancedModeGroup OBJECT-GROUP
    OBJECTS  { t11ZsServerCommit,
                t11ZsServerChangeModeResult,
                t11ZsServerDefaultZoneSetting,
                t11ZsServerMergeControlSetting,
                t11ZsServerDefZoneBroadcast,
                t11ZsAliasName,
                t11ZsAliasRowStatus,
                t11ZsAttribBlockName,
                t11ZsAttribBlockRowStatus,
                t11ZsAttribType,
                t11ZsAttribValue,
                t11ZsAttribRowStatus,
                t11ZsActiveZoneBroadcastZoning,
                t11ZsActiveZoneHardZoning,
                t11ZsActiveAttribType,
                t11ZsActiveAttribValue
              }
    STATUS   current
    DESCRIPTION
           "A collection of additional objects for displaying
           and updating the Zone configuration of a Zone Server
           capable of operating in Enhanced mode."
    ::= { t11ZsMIBGroups 2 }

t11ZsStatisticsGroup OBJECT-GROUP
    OBJECTS  { t11ZsOutMergeRequests,
                t11ZsInMergeAccepts,
                t11ZsInMergeRequests,
                t11ZsOutMergeAccepts,
                t11ZsOutChangeRequests,
                t11ZsInChangeAccepts,
                t11ZsInChangeRequests,
```

```
                t11ZsOutChangeAccepts,
                t11ZsInZsRequests,
                t11ZsOutZsRejects
              }
    STATUS   current
    DESCRIPTION
           "A collection of objects for collecting Zone Server
            statistics information."
    ::= { t11ZsMIBGroups 3 }

t11ZsNotificationControlGroup OBJECT-GROUP
    OBJECTS  { t11ZsNotifyRequestRejectEnable,
                t11ZsNotifyMergeFailureEnable,
                t11ZsNotifyMergeSuccessEnable,
                t11ZsNotifyDefZoneChangeEnable,
                t11ZsNotifyActivateEnable,
                t11ZsRejectCtCommandString,
                t11ZsRejectRequestSource,
                t11ZsRejectReasonCode,
                t11ZsRejectReasonCodeExp,
                t11ZsRejectReasonVendorCode,
                t11ZsFabricIndex
              }
    STATUS   current
    DESCRIPTION
           "A collection of notification control and
           notification information objects for monitoring
           Zone Server request rejection and Zone merge
           failures."
    ::= { t11ZsMIBGroups 4 }

t11ZsActivateGroup OBJECT-GROUP
    OBJECTS  { t11ZsActivateRequest,
                t11ZsActivateDeactivate,
                t11ZsActivateResult,
                t11ZsActivateFailCause,
                t11ZsActivateFailDomainId
              }
    STATUS   current
    DESCRIPTION
           "A collection of objects that allow a Zone Set to
           be activated via SNMP SetRequests and provide the
           status and result of such an activation."
    ::= { t11ZsMIBGroups 5 }

t11ZsNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { t11ZsRequestRejectNotify,
                    t11ZsMergeFailureNotify,
```

```
                    t11ZsMergeSuccessNotify,
                    t11ZsDefZoneChangeNotify,
                    t11ZsActivateNotify }
    STATUS        current
    DESCRIPTION
           "A collection of notification(s) for monitoring
           Zone Server request rejection, Zone merge
           failures and successes, and Default Zoning
           behavioral changes."
    ::= { t11ZsMIBGroups 6 }

END
```

8. IANA Considerations

IANA has assigned two MIB OIDs: one for the T11-FC-FABRIC-LOCK-MIB module (159) and one for the T11-FC-ZONE-SERVER-MIB module (160), under the mib-2 subtree.

9. Security Considerations

There are many management objects defined in these MIB modules 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.

Specifically, unauthorized write access to *any* of the writable objects in these MIB modules could cause unauthorized manipulation of the Zoning information on a Zone Server, and/or the activation of an unauthorized Active Zone Set in a Fabric. This could result in allowing unauthorized connectivity, and/or denying authorized connectivity, between hosts connected to the Fibre Channel network. It could also cause the suppression of notifications (e.g., of unauthorized operations), or the disruption of network operations due to the generation of unwanted notifications.

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.

Unauthorized read access to any of the readable objects in the t11ZsServerTable, t11ZsActiveZoneTable, t11ZsActiveZoneMemberTable, or t11ZsActiveAttribTable tables would reveal information about the

currently authorized connectivity between hosts connected to the Fibre Channel network.

Unauthorized read access to any of the readable objects in the t11ZsSetTable, t11ZsZoneTable, t11ZsSetZoneTable, t11ZsAliasTable, t11ZsZoneMemberTable, t11ZsAttribBlockTable, or t11ZsAttribTable tables would reveal information about potential/alternative connectivity that could be authorized between hosts connected to the Fibre Channel network.

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.

10. Acknowledgements

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T11 Chair: Robert Snively, Brocade
T11 Vice Chair: Claudio DeSanti, Cisco Systems
T11.5 Chair: Roger Cummings, Symantec
T11.5 Vice Chair: Scott Kipp, McData
and T11.5 members.

The document was subsequently a work item of the IETF's IMSS Working Group, chaired by David Black (EMC Corporation). We thank Bert Wijnen (Lucent Technologies) for his thorough review of the document. We also wish to acknowledge Dan Romascanu (Avaya), the IETF Area Director, for his comments and assistance.

11. Normative References

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