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Fibre Channel Name 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 the Name Server function of a Fibre Channel network. The Fibre Channel Name Server provides a means for Fibre Channel ports to register and discover Fibre Channel names and attributes.

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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 the Fibre Channel network's Name Server function, which provides a means for Fibre Channel ports to register and discover Fibre Channel attributes. Such attributes include names, addresses, types, features, etc., at various protocol layers.

2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

3. Short Overview of Fibre Channel

The Fibre Channel (FC) is logically a bidirectional point-to-point serial data channel, structured for high performance. Fibre Channel provides a general transport vehicle for higher-level protocols such as Small Computer System Interface (SCSI) command sets, the High-Performance Parallel Interface (HIPPI) data framing, IP (Internet Protocol), IEEE 802.2, and others.

Physically, Fibre Channel is an interconnection of multiple communication points, called N_Ports, interconnected either by a switching network, called a Fabric, or by a point-to-point link. A Fibre Channel "node" consists of one or more N_Ports. A Fabric may consist of multiple Interconnect Elements, some of which are switches. An N_Port connects to the Fabric via a port on a switch called an F_Port. When multiple FC nodes are connected to a single port on a switch via an "Arbitrated Loop" topology, the switch port is called an FL_Port, and the nodes' ports are called NL_Ports. The term Nx_Port is used to refer to either an N_Port or an NL_Port. The term Fx_Port is used to refer to either an F_Port or an FL_Port. A switch port, which is interconnected to another switch port via an

Inter-Switch Link (ISL), is called an E_Port. A B_Port connects a bridge device with an E_Port on a switch; a B_Port provides a subset of E_Port functionality.

Many Fibre Channel components, including the Fabric, each node, and most ports, have globally-unique names. These globally-unique names are typically formatted as World Wide Names (WWNs). More information on WWNs can be found in [FC-FS]. WWNs are expected to be persistent across agent and unit resets.

Fibre Channel frames contain 24-bit address identifiers, which identify the frame's source and destination ports. Each FC port has both an address identifier and a WWN. When a fabric is in use, the FC address identifiers are 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.

The Fibre Channel Name Server provides a way for N_Ports and NL_Ports to register and discover Fibre Channel attributes. Such attributes include names, addresses, types, features, etc., at various protocol layers, including upper layer protocols specific to Fibre Channel (which are sometimes called "FC-4s"). Communication with the Name Server is via Fibre Channel's CT (Common Transport for Generic Services) using "Information Units" (called CT_IUs) as either requests, responses, or unsolicited.

Registrations may be performed by a third party. However, the Name Server may refuse such third-party registration for unspecified reasons. Once registered, the attributes are made available to requestors.

Requestors could learn about new registrations via periodic polling of the Name Server, but such polling would generate a considerable overhead. To avoid this overhead, the Registered State Change Notification (RSCN) mechanism defined in FC-FS [FC-FS] allows an Nx_Port to register to receive an RSCN whenever an event occurs that may affect the state of other Nx_Port(s), including changes in the information registered with the Name Server.

The Fibre Channel Name Server is defined in the FC-GS specification, The latest specification is [FC-GS-4]; the previous version was [FC-GS-3].

4. Relationship to Other MIBs

The first standardized MIB for Fibre Channel [RFC2837] was focused on Fibre Channel switches. It was obsoleted by the more generic Fibre Channel Management MIB [FC-MGMT], which defines basic information for Fibre Channel hosts and switches, including extensions to the standard IF-MIB [IF-MIB] for Fibre Channel interfaces.

This MIB extends beyond [FC-MGMT] to cover the functionality, in Fibre Channel switches, of providing Fibre Channel's Name Server function.

This MIB also imports some common textual conventions from T11-TC-MIB, defined in [FC-FAM-MIB].

5. MIB Overview

This MIB module provides the means for monitoring the operation of, and configuring some parameters of, one or more instances of Fibre Channel Name Server functionality. (Note that there are no definitions in this MIB module of "managed actions" that can be invoked via SNMP.)

5.1. Fibre Channel Management Instance

A Fibre Channel management instance is defined in [FC-MGMT] as a separable managed instance of Fibre Channel functionality. Fibre Channel functionality may be grouped into Fibre Channel management instances in whatever way is most convenient for the implementation(s). For example, one such grouping accommodates a single SNMP agent having multiple AgentX [RFC2741] sub-agents, with each sub-agent implementing a different Fibre Channel management instance.

The object, fcmInstanceIndex, is IMPORTed from the FC-MGMT-MIB [FC-MGMT] as the index value to uniquely identify each Fibre Channel management instance within the same SNMP context ([RFC3411], section 3.3.1).

5.2. Name Server Information Subset

In addition to allowing for multiple Fibre Channel management instances, this MIB is based on the notion that the information registered with the Name Server is available as one or more subsets. The MIB allows the different subsets to be accessed either:

- via different SNMP agents/contexts,
- via different Fibre Channel management instances within the same SNMP agent/context, and/or
- via the same Fibre Channel management instance within the same SNMP agent/context.

The union of these subsets (across all agents/contexts in the network) represents the total set of information registered with the Name Server. Note that the intersection of the subsets is often non-empty, and the use of the term "subset" does not preclude any subset from containing the complete set of Name Server information. Each of these subsets is identified using an index value called a Name Server Information Subset Index.

Thus, all objects in this MIB are in tables that are INDEXed by at least fcmInstanceIndex and t11NsInfoSubsetIndex, where the latter contains a Name Server Information Subset Index value.

5.3. Fabric Index

The [FC-SW-3] standard for an interconnecting Fabric consisting of multiple Fabric Switch elements describes the operation of a single Fabric in a physical infrastructure. The current [FC-SW-4] standard also supports the operation of multiple Virtual Fabrics operating within one (or more) physical infrastructures. In such a scenario, each Fabric has, of course, its own management instrumentation. In order to accommodate this scenario, this MIB module defines all Fabric-related information in tables that are INDEXed by an arbitrary integer, named a "Fabric Index". In a Fabric that is conformant to [FC-SW-3], the value of this Fabric Index will always be 1.

5.4. The MIB Groups

This section describes the six MIB groups contained in the MIB.

5.4.1. The t11NsDBGroup Group

This group contains information about the operation of the Name Server function acting upon a Name Server Information Subset, including an indication of whether such operation is performed local to a particular Fibre Channel switch, or independently of a Fibre Channel switch. It also contains the information currently registered in a particular Name Server Information Subset.

5.4.2. Three Statistics Groups

There are three groups of Name Server statistics objects:

```
t11NsRequestStatsGroup -- stats about requests
t11NsRscnStatsGroup    -- stats about (Name Server) RSCNs
t11NsRejectStatsGroup  -- stats about rejects
```

Each of these groups is conditionally mandatory; specifically, each group contains objects for particular statistics such that implementation of the group is mandatory only for an implementation that counts/captures the group's particular statistics.

The intent here is not to force implementations to capture these statistics, but rather to have all implementations that do capture them, provide access to them via the same MIB objects.

5.4.3. The t11NsNotifyGroup Group

This group contains a set of notifications that provide for monitoring the rejections of Name Server Registration Requests.

5.4.4. The t11NsNotifyControlGroup Group

This group contains objects for controlling the generation of, and for information to be included in, the notifications defined in the t11NsNotifyGroup group.

5.5. The Actual Values of Objects

The objects defined in the t11NsRegTable represent the values registered with the Name Server. The SNMP agent MUST report the actual values, even if they are incorrectly formatted. This is the reason why, for example, the two objects that represent IP addresses, t11NsNodeIpAddress and t11NsPortIpAddress, have the SYNTAX of OCTET STRING, so that they are able to represent invalid values (which could not be represented using InetAddressType and InetAddress).

Similarly, each set of (t11NsRejectReasonCode, t11NsRejReasonCodeExp, t11NsRejReasonVendorCode) objects must hold the values of the actual reject, explanation, and vendor-specific codes that were present in the generated Reject message (the "Reject CT_IU"), irrespective of whether or not such code values were appropriate.

6. The T11-FC-NAME-SERVER-MIB Module

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

-- The MIB for management of the Fibre Channel functionality which
-- implements the Name Server function.

IMPORTS
    MODULE-IDENTITY,OBJECT-TYPE,
    NOTIFICATION-TYPE, Unsigned32,
    Counter32, Integer32, mib-2   FROM SNMPv2-SMI         -- [RFC2578]
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP            FROM SNMPv2-CONF        -- [RFC2580]
    SnmpAdminString               FROM SNMP-FRAMEWORK-MIB -- [RFC3411]
    TruthValue, TEXTUAL-CONVENTION,
    TimeStamp                     FROM SNMPv2-TC          -- [RFC2579]
    fcmInstanceIndex, FcPortType,
    FcAddressIdOrZero, FcClasses,
    FcNameIdOrZero                FROM FC-MGMT-MIB        -- [FC-MGMT]
    T11FabricIndex                FROM T11-TC-MIB      -- [FC-FAM-MIB]
    t11FamLocalSwitchWwn
                      FROM T11-FC-FABRIC-ADDR-MGR-MIB; -- [FC-FAM-MIB]

t11FcNameServerMIB  MODULE-IDENTITY
    LAST-UPDATED "200603020000Z"
    ORGANIZATION "T11"
    CONTACT-INFO
            "     Claudio DeSanti
                  Cisco Systems, Inc.
                  170 West Tasman Drive
                  San Jose, CA 95134 USA
                  Phone: +1 408 853-9172
                  EMail: cds@cisco.com

                  Keith McCloghrie
                  Cisco Systems, Inc.
                  170 West Tasman Drive
                  San Jose, CA USA 95134
                  Phone: +1 408-526-5260
                  EMail: kzm@cisco.com"
    DESCRIPTION
           "The MIB module for the management of the functionality,
           which realizes the FC-GS-4 requirements for Name
           Server (NS).

           Copyright (C) The Internet Society (2006).  This version of
           this MIB module is part of RFC 4438; see the RFC itself for
           full legal notices."
```

```
    REVISION    "200603020000Z"
    DESCRIPTION
           "Initial version of this MIB module, published as RFC 4438."
    ::= { mib-2 135 }

t11NsNotifications    OBJECT IDENTIFIER ::= { t11FcNameServerMIB 0 }
t11NsMIBObjects       OBJECT IDENTIFIER ::= { t11FcNameServerMIB 1 }
t11NsMIBConformance   OBJECT IDENTIFIER ::= { t11FcNameServerMIB 2 }
t11NsStatus           OBJECT IDENTIFIER ::= { t11NsMIBObjects 1 }
t11NsStatistics       OBJECT IDENTIFIER ::= { t11NsMIBObjects 2 }

-- Textual Conventions

T11NsGs4RejectReasonCode ::= TEXTUAL-CONVENTION
    STATUS    current
    DESCRIPTION
        "The FC-GS-4 reject reason code for a request.

         none(1)
             - no error.
         invalidCmdCode(2)
             - request contained an invalid command code.
         invalidVerLevel(3)
             - request contained an invalid version number.
         logicalError(4)
             - there was a logical error.
         invalidIUSize(5)
             - the CT_IU (Information Unit) size was invalid.
         logicalBusy(6)
             - the module is busy.
         protocolError(7)
             - there was a protocol error.
         unableToPerformCmdReq(8)
             - the command specified in the req could not be
               executed.  The details of exactly what failed
               will be in the corresponding reason code
               explanation.
         cmdNotSupported(9)
             - the command is not supported.
         serverNotAvailable(10)
             - the identified server was not available.
         couldNotEstabSession(11)
             - a server session could not be established.
         vendorError(12)
             - a vendor-specific error."
    REFERENCE
          "ANSI INCITS 387-2004, Fibre Channel - Generic
           Services-4 (FC-GS-4), section 4.4.3."
```

```
    SYNTAX  INTEGER {
              none(1),
              invalidCmdCode(2),
              invalidVerLevel(3),
              logicalError(4),
              invalidIUSize(5),
              logicalBusy(6),
              protocolError(7),
              unableToPerformCmdReq(8),
              cmdNotSupported(9),
              serverNotAvailable(10),
              couldNotEstabSession(11),
              vendorError(12)
            }

T11NsRejReasonCodeExpl ::= TEXTUAL-CONVENTION
    STATUS    current
    DESCRIPTION
        "The reject reason code explanation:

         noAdditionalExplanation(1)
             - no additional explanation.
         portIdentifierNotRegistered(2)
             - Port Identifier not registered.
         portNameNotRegistered(3)
             - Port Name not registered.
         nodeNameNotRegistered(4)
             - Node Name not registered.
         classOfServiceNotRegistered(5)
             - Class of Service not registered.
         nodeIpAddressNotRegistered(6)
             - 'IP Address (Node)' value not registered.
         ipaNotRegistered(7)
             - Initial Process Associator (IPA) not registered.
         fc4TypeNotRegistered(8)
             - FC-4 TYPEs not registered.
         symbolicPortNameNotRegistered(9)
             - Symbolic Port Name not registered.
         symbolicNodeNameNotRegistered(10)
             - Symbolic Node Name not registered.
         portTypeNotRegistered(11)
             - 'Port Type' not registered.
         portIpAddressNotRegistered(12)
             - 'IP Address (Port)' value not registered.
         fabricPortNameNotRegistered(13)
             - Fabric Port Name not registered.
         hardAddressNotRegistered(14)
             - 'Hard Address' not registered.
```

```
        fc4DescriptorNotRegistered(15)
            - FC-4 Descriptor not registered.
        fc4FeaturesNotRegistered(16)
            - FC-4 Features not registered.
        accessDenied(17)
            - Access denied.
        unacceptablePortIdentifier(18)
            - Unacceptable Port Identifier.
        databaseEmpty(19)
            - Database is empty.
        noObjectRegInSpecifiedScope(20)
            - no object has been registered in the specified
              scope.
        domainIdNotPresent(21)
            - Domain ID not present.
        portIdNotPresent(22)
            - Port number not present.
        noDeviceAttached(23)
            - No device attached.
        authorizationException(24)
            - Authorization Exception.
        authenticationException(25)
            - Authentication Exception.
        databaseFull(26)
            - Database full."
    REFERENCE
          "ANSI INCITS 387-2004, Fibre Channel - Generic
           Services-4 (FC-GS-4), sections 4.4.4 and 5.2.4"
    SYNTAX  INTEGER {
              noAdditionalExplanation(1),
              portIdentifierNotRegistered(2),
              portNameNotRegistered(3),
              nodeNameNotRegistered(4),
              classOfServiceNotRegistered(5),
              nodeIpAddressNotRegistered(6),
              ipaNotRegistered(7),
              fc4TypeNotRegistered(8),
              symbolicPortNameNotRegistered(9),
              symbolicNodeNameNotRegistered(10),
              portTypeNotRegistered(11),
              portIpAddressNotRegistered(12),
              fabricPortNameNotRegistered(13),
              hardAddressNotRegistered(14),
              fc4DescriptorNotRegistered(15),
              fc4FeaturesNotRegistered(16),
              accessDenied(17),
              unacceptablePortIdentifier(18),
              databaseEmpty(19),
```

```
               noObjectRegInSpecifiedScope(20),
               domainIdNotPresent(21),
               portIdNotPresent(22),
               noDeviceAttached(23),
               authorizationException(24),
               authenticationException(25),
               databaseFull(26)
           }

--
-- Information about a Name Server Information Subset
--

t11NsInfoSubsetTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF T11NsInfoSubsetEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
           "This table contains one entry for each Name Server
           Information Subset within each Fibre Channel
           management instance."
    ::= { t11NsStatus 1 }

t11NsInfoSubsetEntry OBJECT-TYPE
    SYNTAX        T11NsInfoSubsetEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
           "This entry contains information about operations
           on a particular Name Server Information Subset
           within the Fibre Channel management instance
           identified by fcmInstanceIndex."
    INDEX { fcmInstanceIndex, t11NsInfoSubsetIndex }
    ::= { t11NsInfoSubsetTable 1 }

T11NsInfoSubsetEntry ::= SEQUENCE {
    t11NsInfoSubsetIndex                Unsigned32,
    t11NsInfoSubsetSwitchIndex          Unsigned32,
    t11NsInfoSubsetTableLastChange      TimeStamp,
    t11NsInfoSubsetNumRows              Integer32,
    t11NsInfoSubsetTotalRejects         Counter32,
    t11NsInfoSubsetRejReqNotfyEnable    TruthValue
}

t11NsInfoSubsetIndex OBJECT-TYPE
    SYNTAX        Unsigned32 (1..4294967295)
    MAX-ACCESS    not-accessible
    STATUS        current
```

```
    DESCRIPTION
           "An arbitrary integer value that uniquely identifies
           this Name Server Information Subset amongst all others
           within the same Fibre Channel management instance.

           It is mandatory to keep this value constant between
           restarts of the agent and to make every possible
           effort to keep it constant across such restarts."
    ::= { t11NsInfoSubsetEntry 1 }

t11NsInfoSubsetSwitchIndex OBJECT-TYPE
    SYNTAX        Unsigned32 (0..4294967295)
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The value of this object is zero when operations
           upon this Name Server Information Subset do not occur
           at a local Fibre Channel switch; otherwise, it is
           non-zero and identifies the local switch.

           The switch identified by a non-zero value of this
           object is the same switch as is identified by the
           same value of fcmSwitchIndex."
    REFERENCE
           "fcmSwitchIndex is defined in the FC-MGMT-MIB module"
    ::= { t11NsInfoSubsetEntry 2 }

t11NsInfoSubsetTableLastChange OBJECT-TYPE
    SYNTAX        TimeStamp
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The value of sysUpTime at the time of the last update
           to any entry in the t11NsRegTable with the same values
           of fcmInstanceIndex and t11NsInfoSubsetIndex.  This
           includes creation of an entry, deletion of an entry, or
           modification of an existing entry.  If no such update
           has taken place since the last re-initialization of the
           local network management subsystem, then this object
           contains a zero value."
    ::= { t11NsInfoSubsetEntry 3 }

t11NsInfoSubsetNumRows OBJECT-TYPE
    SYNTAX        Integer32 (0..2147483647)
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The number of Nx_Ports currently registered in this
```

```
            Name Server Information Subset, i.e., the number of
            rows in the t11NsRegTable with the same values of
            fcmInstanceIndex and t11NsInfoSubsetIndex."
    ::= { t11NsInfoSubsetEntry 4 }

t11NsInfoSubsetTotalRejects OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The total number of (CT_IU) Requests for Name Server
            functions that were rejected for inclusion in this
            Name Server Information Subset, across all Fabrics
            for which it contains information.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11NsInfoSubsetEntry 5 }

t11NsInfoSubsetRejReqNotfyEnable OBJECT-TYPE
    SYNTAX        TruthValue
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
            "This object indicates whether 't11NsRejectRegNotify'
            notifications are generated by rejections of requests
            to register information in this Name Server Information
            Subset.

            If value of this object is 'true', then the
            notification is generated when a request is rejected.
            If it is 'false', the notification is not generated.

            The persistence of values of this object across an
            agent reboot is implementation-dependent."
    DEFVAL { false }
    ::= { t11NsInfoSubsetEntry 6 }

--
-- Registered Port Information
--

t11NsRegTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF T11NsRegEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "This table contains entries for all Nx_Ports registered
```

```
            in the identified Name Server Information Subsets across
            all Fabrics for which such subsets contain information."
    ::= { t11NsStatus 2 }

t11NsRegEntry OBJECT-TYPE
    SYNTAX T11NsRegEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "An entry containing information about an Nx_Port
            represented by t11NsRegPortIdentifier that is registered
            with a Name Server Information Subset (identified by
            t11NsInfoSubsetIndex) within the Fibre Channel management
            instance (identified by fcmInstanceIndex) on the Fabric
            (identified by t11NsRegFabricIndex)."
    INDEX { fcmInstanceIndex, t11NsInfoSubsetIndex,
             t11NsRegFabricIndex, t11NsRegPortIdentifier }
    ::= { t11NsRegTable 1 }

T11NsRegEntry ::= SEQUENCE {
    t11NsRegFabricIndex            T11FabricIndex,
    t11NsRegPortIdentifier         FcAddressIdOrZero,
    t11NsRegPortName               FcNameIdOrZero,
    t11NsRegNodeName               FcNameIdOrZero,
    t11NsRegClassOfSvc             FcClasses,
    t11NsRegNodeIpAddress          OCTET STRING,
    t11NsRegProcAssoc              OCTET STRING,
    t11NsRegFc4Type                OCTET STRING,
    t11NsRegPortType               FcPortType,
    t11NsRegPortIpAddress          OCTET STRING,
    t11NsRegFabricPortName         FcNameIdOrZero,
    t11NsRegHardAddress            FcAddressIdOrZero,
    t11NsRegSymbolicPortName       SnmpAdminString,
    t11NsRegSymbolicNodeName       SnmpAdminString,
    t11NsRegFc4Features            OCTET STRING
    }

t11NsRegFabricIndex 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 SW-3, only a single Fabric can
            operate within a single physical infrastructure, and thus,
            the value of this Fabric Index will always be 1.
```

```
            However, it is possible that future standards will define
            how multiple Fabrics, each with its own management
            instrumentation, could operate within one (or more) physical
            infrastructures.  To allow for this future possibility, this
            index value is used to uniquely identify a particular
            Fabric within a physical infrastructure."
    ::= { t11NsRegEntry 1 }

t11NsRegPortIdentifier OBJECT-TYPE
    SYNTAX              FcAddressIdOrZero
    MAX-ACCESS          not-accessible
    STATUS              current
    DESCRIPTION
           "The Fibre Channel Address Identifier of this Nx_Port.
           If no Port Identifier has been registered, then the
           value of this object is the zero-length string."
    ::= { t11NsRegEntry 2 }

t11NsRegPortName OBJECT-TYPE
    SYNTAX        FcNameIdOrZero
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The Port_Name (WWN) of this Nx_Port.
           If this object has not been registered, then its value
           is the zero-length string."
    DEFVAL {''H}
    ::= { t11NsRegEntry 3 }

t11NsRegNodeName OBJECT-TYPE
    SYNTAX        FcNameIdOrZero
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The Node_Name (WWN) of this Nx_Port.
           If this object has not been registered, then its value
           is the zero-length string."
    DEFVAL {''H}
    ::= { t11NsRegEntry 4 }

t11NsRegClassOfSvc OBJECT-TYPE
    SYNTAX        FcClasses
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The class of service indicator.  This object is an
           array of bits that contain a bit map of the classes of
           service supported by the associated port.  If a bit in
```

```
            this object is 1, it indicates that the class of
            service is supported by the associated port.  When a
            bit is set to 0, it indicates that no class of service
            is supported by this Nx_Port.

            If this object has not been not registered for a port,
            then the instance for that port is not instantiated."
    ::= { t11NsRegEntry 5 }

t11NsRegNodeIpAddress OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0 | 16))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The IP address of the node of this Nx_Port, in
            network-byte order, either as a 32-bit IPv4 address or
            a 128-bit IPv6 address.  For the former, the leftmost 96 bits
            (12 bytes) should contain x'00 00 00 00 00 00 00 00 00 00 FF
            FF', and the IPv4 address should be present in the rightmost
            32 bits.

            Note that the value of this object is the IP address value
            that is received in the FC-GS-4 message Register IP address
            (Node) RIP_NN.  It is not validated against any IP address
            format.

            If no 'IP address (Node)' has been registered, then the
            value of this object is the zero-length string."
    REFERENCE
          "ANSI INCITS 387-2004, Fibre Channel - Generic
           Services-4 (FC-GS-4)"
    DEFVAL  { ''H }
    ::= { t11NsRegEntry 6 }

t11NsRegProcAssoc OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0 | 8))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The Fibre Channel Initial Process Associator (IPA).

            If no 'Initial Process Associator' has been registered,
            then the value of this object is the zero-length string."
    REFERENCE
          "ANSI INCITS 387-2004, Fibre Channel - Generic
           Services-4 (FC-GS-4)"
    DEFVAL  { ''H }
    ::= { t11NsRegEntry 7 }
```

```
t11NsRegFc4Type OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0 | 32))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The FC-4 protocol types supported by this Nx_Port.
           This is an array of 256 bits.  Each bit in the array
           corresponds to a Type value as defined by Fibre Channel
           standards and contained in the Type field of the frame
           header.  The order of the bits in the 256-bit (32-byte)
           value is the same as defined in FC-GS-4, section 5.2.3.8,
           and represented in network-byte order.

           If no 'FC-4 TYPEs' has been registered, then the
           value of this object is the zero-length string."
    REFERENCE
           "ANSI INCITS 387-2004, Fibre Channel - Generic
           Services-4 (FC-GS-4), section 5.2.3.8."
    DEFVAL  { ''H }
    ::= { t11NsRegEntry 8 }

t11NsRegPortType OBJECT-TYPE
    SYNTAX        FcPortType
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The port type of this port.

           If no 'Port Type' has been registered, then the value
           of this object is unidentified and is represented by
           the value 'unknown'."
    DEFVAL  { 1 }                -- 'unknown', see [FC-MGMT]
    ::= { t11NsRegEntry 9 }

t11NsRegPortIpAddress OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0 | 16))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The value that Fibre Channel calls an 'IP Address (Port)'
           that represents the IP address of the associated port.
           The value is either in 32-bit IPv4 format or 128-bit IPv6
           format, in network-byte order.  When this object contains an
           IPv4 address, the leftmost 96 bits (12 bytes) should contain
           x'00 00 00 00 00 00 00 00 00 00 FF FF'.  The IPv4 address
           should be present in the rightmost 32 bits.

           Note that the value of this object is the IP address value
```

```
            that is received in the FC-GS-4 message Register IP address
            (Port) RIPP_ID.  It is not validated against any IP address
            format.

            If no 'IP address (Port)' has been registered, then the
            value of this object is the zero-length string."
        REFERENCE
            "ANSI INCITS 387-2004, Fibre Channel - Generic
            Services-4, (FC-GS-4)"
        DEFVAL {''H}
        ::= { t11NsRegEntry 10 }

t11NsRegFabricPortName OBJECT-TYPE
        SYNTAX        FcNameIdOrZero
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The Fabric Port Name (WWN) of the Fx_Port to which
            this Nx_Port is attached.

            If no 'Fabric Port Name' has been registered, then the
            value of this object is the zero-length string."
        DEFVAL {''H}
        ::= { t11NsRegEntry 11 }

t11NsRegHardAddress OBJECT-TYPE
        SYNTAX        FcAddressIdOrZero
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The format of this object is identical to the format
            of Hard Address defined in the Discover Address (ADISC)
            Extended Link Service (FC-FS).

            Hard Address is the 24-bit NL_Port identifier that
            consists of:
              - the 8-bit Domain_ID in the most significant byte
              - the 8-bit Area_ID in the next most significant
                byte
              - the 8-bit AL-PA (Arbitrated Loop Physical Address)
                which an NL_Port attempts acquire during FC-AL
                initialization in the least significant byte.

            If the port is not an NL_Port, or if it is an NL_Port
            but does not have a hard address, then all bits are
            reported as zeros.

            If no 'Hard Address' has been registered, then the
```

```
            value of this object is the zero-length string."
        DEFVAL {''H}
        ::= { t11NsRegEntry 12 }

t11NsRegSymbolicPortName OBJECT-TYPE
        SYNTAX        SnmpAdminString (SIZE (0..255))
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
               "The user-defined name of this port.

               If no 'Symbolic Port Name' has been registered, then
               the value of this object is the zero-length string."
        DEFVAL {''H}
        ::= { t11NsRegEntry 13 }

t11NsRegSymbolicNodeName OBJECT-TYPE
        SYNTAX        SnmpAdminString (SIZE (0..255))
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
               "The user-defined name of the node of this port.

               If no 'Symbolic Node Name' has been registered, then
               the value of this object is the zero-length string."
        DEFVAL {''H}
        ::= { t11NsRegEntry 14 }


t11NsRegFc4Features OBJECT-TYPE
        SYNTAX        OCTET STRING (SIZE (0 | 128))
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
               "The FC-4 Features associated with FC-4 Types on this
               port encoded as a 128-byte value in network-byte order,
               or the zero-length string if no 'FC-4 Features' have been
               registered.

               Section 5.2.3.15 of FC-GS-4 is the authoritative
               definition of the format of the 128-byte value,
               i.e., if different, FC-GS-4 takes precedence over the
               following description:

               The 128-byte value is an array of 4-bit values, one for
               each FC-4 Type value, positioned as follows: the 5 most
               significant bits of a Type value identify where it appears
               within the 128-byte value, specifically, within which word:
```

```
                - Word 0 (of the 128-byte value) contains information
                  related to Types '00' through '07';
                - Word 1 contains information related to Types
                  '08' through 0F';
                - and so forth, up to Word 31, which contains
                  information related to Types 'F8' through 'FF'.

            The least significant of the eight 4-bit values in each
            Word represents an FC-4 Type with 000 as its 3 least
            significant bits, and most significant 4-bit value in
            each Word represents an FC-4 Type with 111 as its 3 least
            significant bits."
    REFERENCE
            "ANSI INCITS 387-2004, Fibre Channel - Generic
            Services-4 (FC-GS-4), section 5.2.3.15."
    DEFVAL {''H}
    ::= { t11NsRegEntry 15 }


--
-- Registered FC-4 Descriptors
--

t11NsRegFc4DescriptorTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF T11NsRegFc4DescriptorEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "This table contains entries for all FC-4 Descriptors
            registered in the identified Name Server Information
            Subsets across all Fabrics for which such subsets
            contain information."
    ::= { t11NsStatus 3 }

t11NsRegFc4DescriptorEntry OBJECT-TYPE
    SYNTAX        T11NsRegFc4DescriptorEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "An entry in the t11NsRegFc4DescriptorTable,
            containing information about an FC-4 Descriptor
            that is associated with a particular FC-4 Type
            value.  The particular FC-4 Descriptor was
            registered by an Nx_Port (identified by
            t11NsRegPortIdentifier) in a Name Server Information
            Subset (identified by t11NsInfoSubsetIndex) within
            the Fibre Channel management instance (identified by
            fcmInstanceIndex) on the Fabric (identified by
```

```
            t11NsRegFabricIndex).

            If no FC-4 Descriptors have been registered
            for a particular port, then there will be no
            entries in this table for that port."
    INDEX { fcmInstanceIndex, t11NsInfoSubsetIndex,
             t11NsRegFabricIndex, t11NsRegPortIdentifier,
             t11NsRegFc4TypeValue }
    ::= { t11NsRegFc4DescriptorTable 1 }

T11NsRegFc4DescriptorEntry ::= SEQUENCE {
    t11NsRegFc4TypeValue           Unsigned32,
    t11NsRegFc4Descriptor          OCTET STRING
}

t11NsRegFc4TypeValue OBJECT-TYPE
    SYNTAX          Unsigned32 (0..255)
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
            "An integer value that identifies an FC-4 Type value
            (representing a particular protocol type, as specified
            in FC-FS) for which an FC-4 Descriptor has been
            registered.

            An instance of this object contains a 'Type value'
            that corresponds to a '1' bit in the value of the
            t11NsRegFc4Type registered for the same port;
            this correspondence is as specified in FC-GS-4."
    REFERENCE
            "ANSI INCITS 387-2004, Fibre Channel - Generic
               Services-4 (FC-GS-4), section 5.2.3.8, and
            ANSI INCITS 373-2003, Fibre Channel - Framing and
               Signaling (FC-FS), section 9.6, Table 29."
    ::= { t11NsRegFc4DescriptorEntry 1 }

t11NsRegFc4Descriptor OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0..255))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The FC-4 Descriptor value that has been registered
            for the particular port on the particular Fabric, and
            for the FC-4 Type represented by the corresponding
            value of t11NsRegFc4TypeIndex.

            The format of an FC-4 Descriptor is dependent on the
            corresponding FC-4 Type value, but is represented in
```

```
            network-byte order."
    REFERENCE
            "ANSI INCITS 387-2004, Fibre Channel - Generic
            Services-4 (FC-GS-4), section 5.2.5.42"
    ::= { t11NsRegFc4DescriptorEntry 2 }


--
-- Name Server per-Fabric Statistics
--

t11NsStatsTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF T11NsStatsEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "This table contains per-Fabric state and statistics
            for operations upon the identified Name Server
            Information Subsets."
    ::= { t11NsStatistics 1 }

t11NsStatsEntry OBJECT-TYPE
    SYNTAX        T11NsStatsEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "An entry in this table contains state and statistics
            for operations upon a Name Server Information Subset
            (identified by t11NsInfoSubsetIndex) within the Fibre
            Channel management instance (identified by
            fcmInstanceIndex) on the Fabric (identified by
            t11NsRegFabricIndex)."
    INDEX { fcmInstanceIndex, t11NsInfoSubsetIndex,
             t11NsRegFabricIndex }
    ::= { t11NsStatsTable 1 }

T11NsStatsEntry ::=  SEQUENCE {
    t11NsInGetReqs                Counter32,
    t11NsOutGetReqs               Counter32,
    t11NsInRegReqs                Counter32,
    t11NsInDeRegReqs              Counter32,
    t11NsInRscns                  Counter32,
    t11NsOutRscns                 Counter32,
    t11NsRejects                  Counter32,
    t11NsDatabaseFull             TruthValue
 }

t11NsInGetReqs OBJECT-TYPE
```

```
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The total number of (CT_IU) Get Requests
           received requesting information from this Name
           Server Information Subset on this Fabric.

           This counter has no discontinuities other than those
           that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 1 }

t11NsOutGetReqs OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The total number of (CT_IU) Get Requests sent in
           order to obtain information needed in this Name Server
           Information Subset on this Fabric.

           This counter has no discontinuities other than those
           that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 2 }

t11NsInRegReqs OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The total number of (CT_IU) Registration Requests
           received to register information in the Name Server
           Information Subset on this Fabric.

           This counter has no discontinuities other than those
           that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 3 }

t11NsInDeRegReqs OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The total number of (CT_IU) De-registration Requests
           received to de-register information from this Name Server
           Information Subset on this Fabric.

           This counter has no discontinuities other than those
```

```
            that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 4 }

t11NsInRscns OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The total number of received RSCNs, indicating
            Name Server-related changes relating to this Name
            Server Information Subset on this Fabric.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 5 }

t11NsOutRscns OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The total number of transmitted RSCNs, indicating
            Name Server-related changes relating to this Name
            Server Information Subset on this Fabric.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 6 }

t11NsRejects OBJECT-TYPE
    SYNTAX        Counter32
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "The total number of CT_IU Requests for Name
            Server functions on this Name Server Information
            Subset on this Fabric that were rejected.

            This counter has no discontinuities other than those
            that all Counter32s have when sysUpTime=0."
    ::= { t11NsStatsEntry 7 }

t11NsDatabaseFull OBJECT-TYPE
    SYNTAX        TruthValue
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
            "An indication of whether the database containing this
```

```
            Name Server Information Subset is full.  This object is
            set to 'true' only if the Name Server is unable to allocate
            space for a new entry for the corresponding Fabric, and it is
            set to 'false' whenever an existing entry is deleted for the
            corresponding Fabric."
    ::= { t11NsStatsEntry 8 }

--
-- Reject information objects
--

t11NsRejectTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF T11NsRejectEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "This table contains information about the most recent
            Name Server Registration Request failures for various
            ports on various Fabrics.

            If no information is available about the most recent
            rejection of a Registration Request on a particular port
            on a particular Fabric, then there will no entry in this
            table for that port and Fabric.

            When a t11NsRejectRegNotify notification is sent for
            such a Registration Request failure, the values of the
            objects in the relevant entry of this table are updated
            immediately prior to generating the notification."
    ::= { t11NsStatus 4 }

t11NsRejectEntry OBJECT-TYPE
    SYNTAX T11NsRejectEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
            "An entry containing information about the most recent
            rejection of a request to register information in the Name
            Server Information Subset (identified by
            t11NsInfoSubsetIndex) within the Fibre Channel management
            instance (identified by fcmInstanceIndex) for a particular
            port (identified by t11NsRegPortIdentifier) on a particular
            Fabric (identified by t11NsRegFabricIndex)."
    INDEX { fcmInstanceIndex, t11NsInfoSubsetIndex,
             t11NsRegFabricIndex, t11NsRegPortIdentifier }
    ::= { t11NsRejectTable 1 }

T11NsRejectEntry ::= SEQUENCE {
```

```
    t11NsRejectCtCommandString   OCTET STRING,
    t11NsRejectReasonCode        T11NsGs4RejectReasonCode,
    t11NsRejReasonCodeExp        T11NsRejReasonCodeExpl,
    t11NsRejReasonVendorCode     OCTET STRING
}

t11NsRejectCtCommandString OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE (0..255))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "The binary content of the Registration Request,
           formatted as an octet string (in network byte
           order) containing the CT_IU, as described in
           Table 2 of [FC-GS-4] (including the preamble),
           which was most recently rejected for the particular
           Name Server Information Subset on the particular port
           on the particular 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)."
    ::= { t11NsRejectEntry 1 }

t11NsRejectReasonCode OBJECT-TYPE
    SYNTAX        T11NsGs4RejectReasonCode
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "A registration reject reason code.  This object
           contains the reason code of the most recent Name
           Server Registration Request failure for the
           particular port on the particular Fabric."
    ::= { t11NsRejectEntry 2 }

t11NsRejReasonCodeExp OBJECT-TYPE
    SYNTAX        T11NsRejReasonCodeExpl
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "A registration reject reason code explanation.  This
           object contains the reason code explanation of the most
           recent Name Server Registration Request failure for the
           particular port on the particular Fabric."
    ::= { t11NsRejectEntry 3 }
```

```
t11NsRejReasonVendorCode OBJECT-TYPE
    SYNTAX        OCTET STRING (SIZE(1))
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
           "A registration reject vendor-specific code.  This
           object contains the vendor-specific code of the most
           recent Name Server Registration Request failure for the
           particular port on the particular Fabric."
    ::= { t11NsRejectEntry 4 }


--
-- Notifications
--

t11NsRejectRegNotify NOTIFICATION-TYPE
    OBJECTS   { t11FamLocalSwitchWwn,
                t11NsRegPortName, t11NsRejectCtCommandString,
                t11NsRejectReasonCode, t11NsRejReasonCodeExp,
                t11NsRejReasonVendorCode }
    STATUS    current
    DESCRIPTION
           "This notification is generated whenever a request to
           register information in a Name Server Information
           Subset (for which the corresponding instance of
           t11NsInfoSubsetRejReqNotfyEnable is 'true') is
           rejected on a particular Fabric for a particular Nx_Port.

           The value of t11FamLocalSwitchWwn indicates the
           WWN of the switch that received the request.
           (If the WWN is unavailable, the value is set to
           the zero-length string.)

           The value of t11NsRejectCtCommandString indicates
           the rejected request, and the values of
           t11NsRejectReasonCode, t11NsRejReasonCodeExp, and
           t11NsRejReasonVendorCode indicate the reason for
           the rejection.

           The value of t11NsRegPortName represents the Port Name
           if it is able to be extracted out of the Registration
           Request, or otherwise the value as currently registered
           on the port."
    ::= { t11NsNotifications 1 }

--
-- Conformance
```

```
--

t11NsMIBCompliances OBJECT IDENTIFIER ::= {t11NsMIBConformance 1}
t11NsMIBGroups      OBJECT IDENTIFIER ::= {t11NsMIBConformance 2}

t11NsMIBCompliance MODULE-COMPLIANCE
    STATUS    current
    DESCRIPTION
           "The compliance statement for entities that
           implement the Fibre Channel Name Server."
    MODULE MANDATORY-GROUPS {t11NsDBGroup,
                             t11NsNotifyControlGroup,
                             t11NsNotifyGroup}

      OBJECT t11NsInfoSubsetRejReqNotfyEnable
      MIN-ACCESS read-only
      DESCRIPTION
             "Write access is not required."

      GROUP t11NsRequestStatsGroup
      DESCRIPTION
             "This group is mandatory only for an implementation
             that captures statistics related to Name Server
             requests."

      GROUP t11NsRscnStatsGroup
      DESCRIPTION
             "This group is mandatory only for an implementation
             that captures statistics related to Name
             Server-related RSCNs."

      GROUP t11NsRejectStatsGroup
      DESCRIPTION
             "This group is mandatory only for an implementation
             that captures statistics related to Name Server
             rejects."

    ::= { t11NsMIBCompliances 1 }

-- Units of conformance

t11NsDBGroup        OBJECT-GROUP
    OBJECTS { t11NsInfoSubsetSwitchIndex,
              t11NsInfoSubsetTableLastChange,
              t11NsInfoSubsetNumRows,
              t11NsRegPortName,
              t11NsRegNodeName,
              t11NsRegClassOfSvc,
```

```
              t11NsRegNodeIpAddress,
              t11NsRegProcAssoc,
              t11NsRegFc4Type,
              t11NsRegPortType,
              t11NsRegPortIpAddress,
              t11NsRegFabricPortName,
              t11NsRegHardAddress,
              t11NsRegSymbolicPortName,
              t11NsRegSymbolicNodeName,
              t11NsRegFc4Features,
              t11NsRegFc4Descriptor }
    STATUS current
    DESCRIPTION
           "A collection of objects for monitoring the information
           registered in a Name Server Information Subset."
    ::= { t11NsMIBGroups 1 }

t11NsRequestStatsGroup OBJECT-GROUP
    OBJECTS { t11NsInGetReqs,
              t11NsOutGetReqs,
              t11NsInRegReqs,
              t11NsInDeRegReqs,
              t11NsDatabaseFull}
    STATUS current
    DESCRIPTION
           "A collection of objects for displaying Name
           Server statistics and state for Name Server requests."
    ::= { t11NsMIBGroups 2 }

t11NsRscnStatsGroup OBJECT-GROUP
    OBJECTS { t11NsInRscns,
              t11NsOutRscns }
    STATUS current
    DESCRIPTION
           "A collection of objects for displaying Name
           Server statistics for Name Server-related RSCNs."
    ::= { t11NsMIBGroups 3 }

t11NsRejectStatsGroup OBJECT-GROUP
    OBJECTS { t11NsInfoSubsetTotalRejects,
              t11NsRejects }
    STATUS current
    DESCRIPTION
           "A collection of objects for displaying Name
           Server statistics for rejects."
    ::= { t11NsMIBGroups 4 }

t11NsNotifyControlGroup  OBJECT-GROUP
```

```
    OBJECTS { t11NsRejectCtCommandString,
              t11NsRejectReasonCode,
              t11NsRejReasonCodeExp,
              t11NsRejReasonVendorCode,
              t11NsInfoSubsetRejReqNotfyEnable }
    STATUS current
    DESCRIPTION
           "A collection of notification control and
           notification information objects for monitoring
           rejections of Name Server registrations."
    ::= { t11NsMIBGroups 5 }

t11NsNotifyGroup        NOTIFICATION-GROUP
    NOTIFICATIONS {t11NsRejectRegNotify }
    STATUS current
    DESCRIPTION
           "A collection of notifications for monitoring
           rejections of Name Server registrations."
    ::= { t11NsMIBGroups 6 }

END
```

7. Acknowledgements

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

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10. IANA Considerations

IANA has assigned a MIB OID to the T11-FC-NAME-SERVER-MIB module under the appropriate subtree.

11. Security Considerations

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

```
t11NsInfoSubsetRejReqNotfyEnable -- the ability to enable/disable
                                    notifications.
```

Such objects may be considered sensitive or vulnerable in some network environments. For example, the ability to change network topology or network speed may afford an attacker the ability to obtain better performance at the expense of other network users. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

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

t11NsRegTable -- contains information about registered Nx_Ports.

t11NsStatsTable -- contains statistics and state information about the Name Server.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

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

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

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