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Definitions of Managed Objects for iSNS (Internet Storage Name Service)

Status of This Memo

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Abstract

The iSNS (Internet Storage Name Service) protocol provides storage name service functionality on an IP network that is being used for iSCSI (Internet Small Computer System Interface) or iFCP (Internet Fibre Channel Protocol) storage. This document provides a mechanism to monitor multiple iSNS Servers, including information about registered objects in an iSNS Server.

Table of Contents

1. 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].

2. Introduction

The iSNS protocol, as described in RFC 4171 [RFC4171], can be used by IP-based storage devices for dynamic registration and discovery of other storage devices in the network. It has the capability to group devices into storage Discovery Domains, and Discovery Domains into Discovery Domain Sets. The iSNS MIB is designed to allow Simple Network Management Protocol (SNMP) to be used to monitor iSNS servers supporting iSCSI [RFC3720] and iFCP [RFC4172].

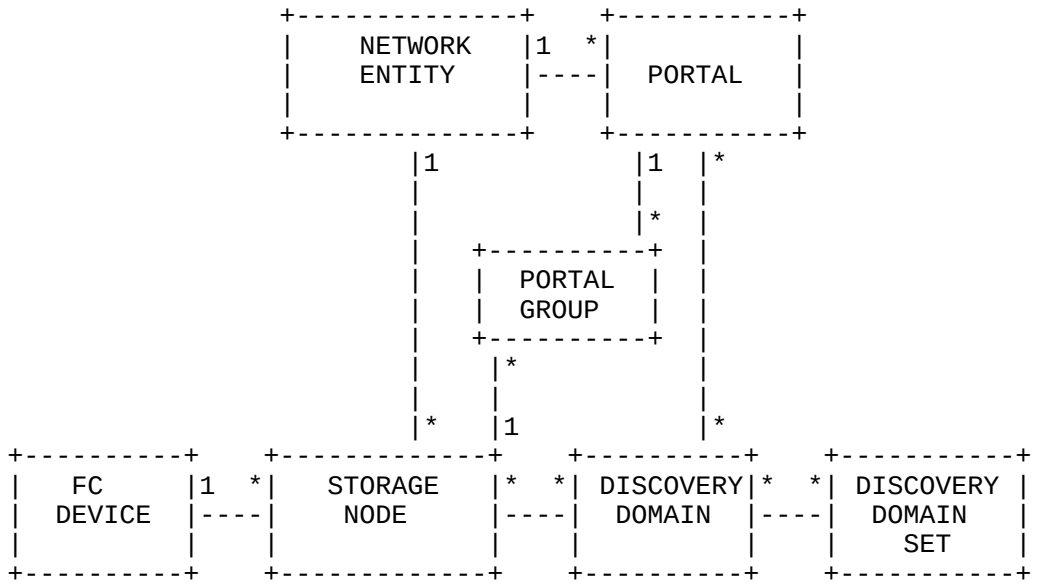
2.1. Requirement Levels

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 [RFC2119].

3. Technical Description

3.1. iSNS Registered Objects

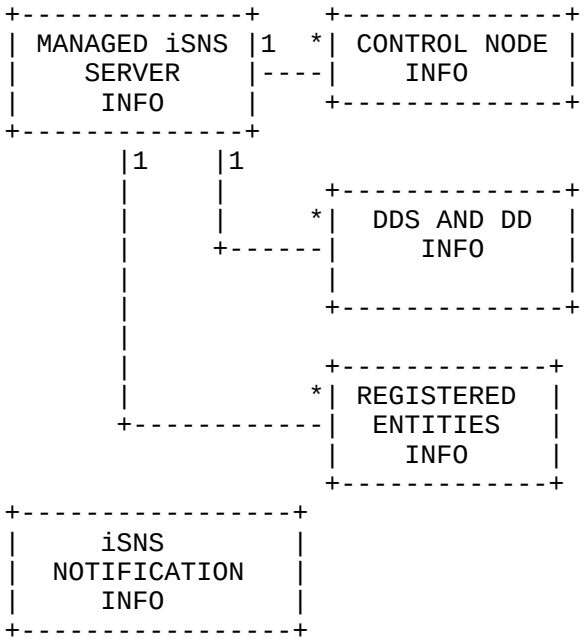
The following entity relationship figure indicates the objects that can be registered in the iSNS, and their relationship to each other.



* represents 0 to many possible relationships

3.2. iSNS MIB Structure

The MIB is divided into sections for iSNS server information, iSNS server registered objects information, and iSNS notifications.



The sections that are required to implement are for iSNS Server management and notification.

3.3. iSNS Server Info

The isnsServerInfo section provides the ability to monitor multiple iSNS Server instances. The isnsServerTable table provides information on each server instance. This table is indexed by the variable isnsServerIndex. The table indicates current settings for each iSNS server being managed. The network address, TCP and UDP ports being used by a server for iSNSP registrations and queries can be determined from this table.

The count of objects registered in each iSNS server instance is shown in the table isnsNumObjectsTable. The provides a summary of the number Discovery Domain Sets, Discovery Domains, Entities, Portals, Portal Groups, iSCSI Nodes, and iFCP FC Nodes and Ports.

3.3.1. Control Node Information

As defined in the iSNS specification, Control Nodes are objects that have been registered with the server and are allowed to manage the iSNS server. These Control Nodes are identified by their iSCSI Node Name or iFCP FC Port Name. The isnsControlNodeInfo section of the MIB provides the ability to view the currently registered set of iSCSI and iFCP control nodes.

3.3.2. Discovery Domain Set (DDS)

The isnsDdsInfo section provides information on each registered DDS, the Discovery Domain members of each DDS, for each iSNS Server instance being managed. DDSs provide a method to group multiple Discovery Domains for easier control. As described in the iSNS Specification [RFC4171], a DDS can be enabled or disabled, which in turn enables or disables the member Discovery Domains. Discovery Domains that are contained in an enabled DDS are then enforced by an iSNS Server.

3.3.3. Discovery Domain (DD)

The isnsDdInfo section provides information on each registered DD, and the DD members, for each iSNS Server instance being managed. DDs are collections of storage nodes and portals that are allowed to discover one another. DD members can be iSCSI nodes, Entity Portals, or iFCP nodes.

3.3.4. Registered Storage Objects

The isnsReg section provides information on the registered storage objects for a specific iSNS Server instance. This section is divided into subsections for Entities, Portals, and iSCSI Nodes, as well as iFCP Port and Node information.

3.3.4.1. Registered Entities

The isnsRegEntityInfo section provides information on the registered entities. Entities are collections of storage nodes and portals.

3.3.4.2. Registered Portals

The isnsRegPortalInfo section provides information on the registered portals for a specific iSNS Server instance. Portals are logical IP-Address, TCP/UDP Port pairs that provide access to storage nodes contained in the associated Entity.

3.3.4.3. Registered Portal Groups

The isnsRegPortalGroupInfo section provides information on the registered portal groups for a specific iSNS Server instance. As described in iSCSI [RFC3720], Portal Groups provide a mapping between Portals and iSCSI Storage Nodes contained in an Entity.

3.3.4.4. Registered iSCSI Nodes

The isnsRegIscsiNodeInfo section provides information on the registered iSCSI Nodes for a specific iSNS Server instance. The iSCSI nodes are individual storage targets or initiators.

3.3.4.5. Registered FC Ports

The isnsRegFcPortInfo section provides information on the registered FC Ports for a specific iSNS Server instance. The FC Ports are ports associated with an iFCP gateway.

3.3.4.6. Registered FC Nodes

The isnsRegFcNodeInfo section provides information on the registered FC Nodes for a specific iSNS Server instance. The FC nodes are individual storage devices associated with an iFCP gateway.

3.4. Multiple Server Instances

The management of multiple instances of iSNS servers by the agent is supported. As described in Section 3.3, each managed iSNS server instance has an entry in the table isnsServerTable.

3.5. iSNS Notifications

The isnsNotification section provides SNMP notifications for iSNS Server state changes.

4. MIB References

The following MIB module has IMPORTS from [RFC2578], [RFC2579], [RFC2580], [RFC3411], [RFC4001], [RFC4044], and [RFC4133]. In REFERENCE clauses, it also refers to [RFC3720], [RFC4171], and [RFC4172].

5. MIB Module

```
   ISNS-MIB DEFINITIONS ::= BEGIN
      IMPORTS
      --  From RFC 2578
          MODULE-IDENTITY,
          OBJECT-TYPE,
          NOTIFICATION-TYPE,
          Integer32,
          Unsigned32,
          Gauge32,
          mib-2
               FROM SNMPv2-SMI

      --  From RFC 2579
          TEXTUAL-CONVENTION,
          TimeStamp,
          TruthValue
               FROM SNMPv2-TC

      --  From RFC 2580
          OBJECT-GROUP,
          MODULE-COMPLIANCE,
          NOTIFICATION-GROUP
               FROM SNMPv2-CONF

      --  From RFC 3411
          SnmpAdminString
               FROM SNMP-FRAMEWORK-MIB

      --  From RFC 4001
          InetAddressType,
          InetAddress,
          InetPortNumber
               FROM INET-ADDRESS-MIB

      --  From RFC 4044
          FcNameIdOrZero,
          FcAddressIdOrZero
               FROM FC-MGMT-MIB

      --  From RFC 4133
          PhysicalIndex
               FROM ENTITY-MIB
        ;

      isnsMIB  MODULE-IDENTITY
            LAST-UPDATED "200707110000Z"
```

```
            ORGANIZATION "IETF IPS Working Group"
            CONTACT-INFO "
              Attn: Kevin Gibbons
                    2Wire, Inc.
                    1704 Automation Parkway
                    San Jose, CA 95131
                    USA
                    Tel: +1 408-895-1387
                    Fax: +1 408-428-9590
                    Email: kgibbons@yahoo.com

                    G.D. Ramkumar
                    SnapTell, Inc.
                    2741 Middlefield Rd, Suite 200
                    Palo Alto, CA 94306
                    USA
                    Tel: +1 650-326-7627
                    Fax: +1 650-326-7620
                    Email: gramkumar@stanfordalumni.org

                    Scott Kipp
                    Brocade
                    4 McDATA Pkwy
                    Broomfield, CO 80021
                    USA
                    Tel: +1 720-558-3452
                    Fax: +1 720-558-8999
                    Email: skipp@brocade.com
                          "

               DESCRIPTION
                       "This module defines management information
                        specific to internet Storage Name Service
                        (iSNS) management.

                        Copyright (C) The IETF Trust (2007).
                        This version of this MIB module is part
                        of RFC 4939; see the RFC itself for full
                        legal notices."

               REVISION    "200707110000Z"

               DESCRIPTION
                        "Initial version of iSNS Management Module.
                         This MIB published as RFC 4939."
                 ::=  { mib-2 163 }
```

```
   --
   --  Textual Conventions
   --

IsnsDiscoveryDomainSetId ::= TEXTUAL-CONVENTION
    DISPLAY-HINT   "d"
    STATUS         current
    DESCRIPTION
"The unique Discovery Domain Set Identifier associated with a
 Discovery Domain Set (DDS)."
    REFERENCE      "RFC 4171, Section 6.11.1.1"
    SYNTAX         Unsigned32 ( 1 .. 4294967295 )

IsnsDdsStatusType ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION
"The status of a Discovery Domain Set (DDS) registered in the
 iSNS.  The initially assigned values are below:
              Bit           Status
           ---------       ---------
              31            DDS Enabled
           All others       RESERVED

 Setting a bit to 1 indicates the feature is enabled.
 Otherwise, it is disabled.  The future assignment of any of
 the reserved values will be documented in a revision of
 RFC 4171."
    REFERENCE      "RFC 4171, Section 6.11.1.3"
    SYNTAX         BITS {
        reserved0(0), reserved1(1), reserved2(2),
        reserved3(3), reserved4(4), reserved5(5),
        reserved6(6), reserved7(7), reserved8(8),
        reserved9(9), reserved10(10), reserved11(11),
        reserved12(12), reserved13(13), reserved14(14),
        reserved15(15), reserved16(16), reserved17(17),
        reserved18(18), reserved19(19), reserved20(20),
        reserved21(21), reserved22(22), reserved23(23),
        reserved24(24), reserved25(25), reserved26(26),
        reserved27(27), reserved28(28), reserved29(29),
        reserved30(30),
        ddsEnabled (31)
                       }

IsnsDiscoveryDomainId ::= TEXTUAL-CONVENTION
    DISPLAY-HINT   "d"
    STATUS         current
    DESCRIPTION
"The unique Discovery Domain Identifier (DD_ID) associated
```

```
        with each Discovery Domain (DD).  This is used to
        uniquely index and reference a DD."
           REFERENCE      "RFC 4171, Section 6"
           SYNTAX         Unsigned32 ( 1 .. 4294967295 )

       IsnsDdFeatureType ::= TEXTUAL-CONVENTION
           STATUS         current
           DESCRIPTION
       "This type defines the features that each Discovery Domain
        (DD) has.
                    Bit           Status
                 ---------       ---------
                    31            Boot List
                 All others       RESERVED

        Boot List: this feature indicates that the targets
        in this DD provide boot capabilities for the member
        initiators.

        Setting a bit to 1 indicates the feature is enabled.
        Otherwise, it is disabled.  The future assignment of any of
        the reserved values will be documented in a revision of
        RFC 4171."
           REFERENCE      "RFC 4171, Section 6.11.2.9"
           SYNTAX         BITS {
               reserved0(0), reserved1(1), reserved2(2),
               reserved3(3), reserved4(4), reserved5(5),
               reserved6(6), reserved7(7), reserved8(8),
               reserved9(9), reserved10(10), reserved11(11),
               reserved12(12), reserved13(13), reserved14(14),
               reserved15(15), reserved16(16), reserved17(17),
               reserved18(18), reserved19(19), reserved20(20),
               reserved21(21), reserved22(22), reserved23(23),
               reserved24(24), reserved25(25), reserved26(26),
               reserved27(27), reserved28(28), reserved29(29),
               reserved30(30),
               bootlist(31)
                              }

       IsnsDdDdsModificationType ::= TEXTUAL-CONVENTION
           STATUS         current
           DESCRIPTION
       "The methods that can be used to modify the Discovery
        Domain and Discovery Domain Sets in an iSNS Server
        instance.
               Bit             Flag Description
            ---------   -----------------------------------
                0       Control Nodes are allowed
```

```
                1       Target iSCSI Nodes are allowed
                2       Initiator iSCSI Nodes are allowed
                3       Target iFCP Ports are allowed
                4       Initiator iFCP Ports are allowed

         Setting a bit to 1 indicates the feature is
         enabled.  Otherwise, it is disabled."
            REFERENCE      "RFC 4171, Section 2.4"
            SYNTAX         BITS {
                              controlNode(0),
                              targetIscsiNode(1),
                              initiatorIscsiNode(2),
                              targetIfcpNode(3),
                              initiatorIfcpNode(4)
                                }

        IsnsEntityIndexIdOrZero ::= TEXTUAL-CONVENTION
            DISPLAY-HINT   "d"
            STATUS         current
            DESCRIPTION
        "The identifier for the unique integer Entity Index
         associated with an iSNS registered Entity object, and the
         value zero.  The value zero is object-specific and MUST
         therefore be defined as part of the description of any
         object that uses this syntax.  Examples of the usage of
         zero might include situations where the Entity is unknown,
         or not yet registered in the iSNS server.  If a value of
         zero is not valid for an object, then that MUST be
         indicated."
            REFERENCE      "RFC 4171, Section 6"
            SYNTAX         Unsigned32 ( 0 .. 4294967295 )

        IsnsPortalGroupIndexId ::= TEXTUAL-CONVENTION
            DISPLAY-HINT   "d"
            STATUS         current
            DESCRIPTION
        "The identifier for the unique integer Portal Group Index
         associated with an iSNS registered Portal Group object."
            REFERENCE      "RFC 4171, Section 6"
            SYNTAX         Unsigned32 ( 1 .. 4294967295 )

        IsnsPortalIndexId ::= TEXTUAL-CONVENTION
            DISPLAY-HINT   "d"
            STATUS         current
            DESCRIPTION
        "The identifier for the unique integer Portal Index
         associated with an iSNS registered Portal object.  The
         index is created by the iSNS Server for mapping between
```

```
        registered objects.  The Portal Index used for a specific
        portal IP-address and port number pair is only persistent
        across reboots for portals that have been explicitly added
        to a Discovery Domain (DD).  If a portal is not explicitly
        registered in any DD, then the index used for a portal can
        change after a server reinitialization."
           REFERENCE      "RFC 4171, Section 6"
           SYNTAX         Unsigned32 ( 1 .. 4294967295 )

      IsnsPortalPortTypeId ::= TEXTUAL-CONVENTION
           STATUS         current
           DESCRIPTION
      "The UDP or TCP port type being used by a Portal for an
        Entity."
           REFERENCE      "RFC 4171, Section 6.3.2"
           SYNTAX         INTEGER { udp(1), tcp(2) }

      IsnsPortalGroupTagIdOrNull ::= TEXTUAL-CONVENTION
           DISPLAY-HINT   "d"
           STATUS         current
           DESCRIPTION
      "The Portal Group Tag (PGT) represents an association
        between a Portal and iSCSI Node using the value range
        0 to 65535.  A PGT with no association is a NULL
        value.  The value of -1 indicates a NULL value."
           REFERENCE      "RFC 4171, Section 6.5.4, and RFC 3720"
           SYNTAX         Integer32 ( -1 .. 65535 )

      IsnsPortalSecurityType ::= TEXTUAL-CONVENTION
           STATUS         current
           DESCRIPTION
      "Indicates security attribute settings for a Portal that is
        registered in the iSNS server.  The bitmapVALID field must
        be set in order for the contents to be considered valid
        information.  The definitions of the bit fields are based
        on RFC 4171.  The initial representation of each bit setting
        (0 or 1) is indicated below.
              Bit             Flag Description
            ---------   ----------------------------------
               25       1 = Tunnel Mode Preferred; 0 = No Preference
               26       1 = Transport Mode Preferred; 0 = No
                        Preference
               27       1 = PFS Enabled; 0 = PFS Disabled
               28       1 = Aggressive Mode Enabled; 0 = Disabled
               29       1 = Main Mode Enabled; 0 = MM Disabled
               30       1 = IKE/IPsec Enabled; 0 = IKE/IPsec
                        Disabled
               31       1 = Bitmap VALID; 0 = INVALID
```

```
           All others  RESERVED

        The future assignment of any of the reserved values will be
        documented in a revision of RFC 4171."
           REFERENCE      "RFC 4171, Section 6.3.9"
           SYNTAX        BITS {
               reserved0(0), reserved1(1), reserved2(2),
               reserved3(3), reserved4(4), reserved5(5),
               reserved6(6), reserved7(7), reserved8(8),
               reserved9(9), reserved10(10), reserved11(11),
               reserved12(12), reserved13(13), reserved14(14),
               reserved15(15), reserved16(16), reserved17(17),
               reserved18(18), reserved19(19), reserved20(20),
               reserved21(21), reserved22(22), reserved23(23),
               reserved24(24),
               tunnelModePreferred(25),
               transportModePreferred(26),
               pfsEnabled(27),
               agressiveModeEnabled(28),
               mainModeEnabled(29),
               ikeIPsecEnabled(30),
               bitmapVALID(31)
                              }

      IsnsNodeIndexId ::= TEXTUAL-CONVENTION
          DISPLAY-HINT   "d"
          STATUS         current
          DESCRIPTION
      "The identifier for the unique integer Node Index associated
       with a storage node.  This index provides a 1-to-1 mapping
       to an iSCSI node name.  The iSCSI node name maximum length
       is too long to be used for an index directly.  The iSCSI
       node index used for a specific iSCSI node name is identical
       in all DDs, and is persistent across server
       reinitializations when the iSCSI node is a member of a
       Discovery Domain (DD) or is registered as a Control Node.
       Furthermore, index values for recently deregistered objects
       SHOULD NOT be reused in the short term."
          REFERENCE      "RFC 4171, Section 6.4.5"
          SYNTAX         Unsigned32 ( 1 .. 4294967295 )

      IsnsIscsiNodeType ::= TEXTUAL-CONVENTION
          STATUS         current
          DESCRIPTION
      "The iSCSI Node Type defines the functions of the registered
       object.  The definitions of each setting are defined in
       RFC 4171.
                    Bit          Node Type
```

```
                ---------       ---------
                   29            Control
                   30            Initiator
                   31            Target
                All others       RESERVED

       Setting a bit to 1 indicates the node has the corresponding
       characteristics.  The future assignment of any of the
       reserved values will be documented in a revision of
       RFC 4171."
          REFERENCE      "RFC 4171, Section 6.4.2"
          SYNTAX         BITS {
              reserved0(0), reserved1(1), reserved2(2),
              reserved3(3), reserved4(4), reserved5(5),
              reserved6(6), reserved7(7), reserved8(8),
              reserved9(9), reserved10(10), reserved11(11),
              reserved12(12), reserved13(13), reserved14(14),
              reserved15(15), reserved16(16), reserved17(17),
              reserved18(18), reserved19(19), reserved20(20),
              reserved21(21), reserved22(22), reserved23(23),
              reserved24(24), reserved25(25), reserved26(26),
              reserved27(27), reserved28(28),
              control(29),
              initiator(30),
              target(31)
                             }

      IsnsFcClassOfServiceType ::= TEXTUAL-CONVENTION
          STATUS         current
          DESCRIPTION
      "This defines the Fibre Channel Class of Service types
       that are supported by the registered port.  The
       definitions are as defined in RFC 4171.
             Bit              FC COS Type
           ---------          ----------------
              28             Fibre Channel Class 3 Supported
              29             Fibre Channel Class 2 Supported
           All others        RESERVED

       Setting a bit to 1 indicates the class of service is
       supported.  The future assignment of any of the
       reserved values will be documented in a revision of
       RFC 4171."
          REFERENCE      "RFC 4171, Section 6.6.8"
          SYNTAX         BITS {
              reserved0(0), reserved1(1), reserved2(2),
              reserved3(3), reserved4(4), reserved5(5),
              reserved6(6), reserved7(7), reserved8(8),
```

```
            reserved9(9), reserved10(10), reserved11(11),
            reserved12(12), reserved13(13), reserved14(14),
            reserved15(15), reserved16(16), reserved17(17),
            reserved18(18), reserved19(19), reserved20(20),
            reserved21(21), reserved22(22), reserved23(23),
            reserved24(24), reserved25(25), reserved26(26),
            reserved27(27),
            class3(28),
            class2(29)
                        }

    IsnsIscsiScnType ::= TEXTUAL-CONVENTION
        STATUS         current
        DESCRIPTION
    "The iSCSI Node State Change Notification (SCN) values
     for a node as defined in RFC 4171.
              Bit                Description
           ------------       ----------------
            24                Initiator and self information only
            25                Target and self information only
            26                Management registration/SCN
            27                Object removed
            28                Object added
            29                Object updated
            30                DD or DDS member removed (Mgmt
                              Reg/SCN only)
            31 (Lsb)          DD or DDS member added (Mgmt
                              Reg/SCN only)
            All others        Reserved

     Setting a bit to 1 indicates that type of SCN is enabled.
     The future assignment of any of the reserved values will be
     documented in a revision of RFC 4171."
        REFERENCE      "RFC 4171, Section 6.4.4"
        SYNTAX         BITS {
            reserved0(0), reserved1(1), reserved2(2),
            reserved3(3), reserved4(4), reserved5(5),
            reserved6(6), reserved7(7), reserved8(8),
            reserved9(9), reserved10(10), reserved11(11),
            reserved12(12), reserved13(13), reserved14(14),
            reserved15(15), reserved16(16), reserved17(17),
            reserved18(18), reserved19(19), reserved20(20),
            reserved21(21), reserved22(22), reserved23(23),
            initiatorAndSelfOnly(24),
            targetAndSelfOnly(25),
            managementRegistrationScn(26),
            objectRemoved(27),
            objectAdded(28),
```

```
            objectUpdated(29),
            ddOrDdsMemberRemoved(30),
            ddOrDdsMemberAdded(31)
                           }

      IsnsIfcpScnType ::= TEXTUAL-CONVENTION
          STATUS         current
          DESCRIPTION
      "The iFCP State Change Notification (SCN) values for an iFCP
       object as defined in RFC 4171.
                Bit                Description
              ------------       ----------------
              24                 Initiator and self information only
              25                 Target and self information only
              26                 Management registration/SCN
              27                 Object removed
              28                 Object added
              29                 Object updated
              30                 DD or DDS member removed (Mgmt
                                 Reg/SCN only)
              31 (Lsb)           DD or DDS member added (Mgmt
                                 Reg/SCN only)
              All others         Reserved

       Setting a bit to 1 indicates that type of SCN is enabled.
       The future assignment of any of the reserved values will be
       documented in a revision of RFC 4171."
          REFERENCE      "RFC 4171, Section 6.6.12"
          SYNTAX         BITS {
              reserved0(0), reserved1(1), reserved2(2),
              reserved3(3), reserved4(4), reserved5(5),
              reserved6(6), reserved7(7), reserved8(8),
              reserved9(9), reserved10(10), reserved11(11),
              reserved12(12), reserved13(13), reserved14(14),
              reserved15(15), reserved16(16), reserved17(17),
              reserved18(18), reserved19(19), reserved20(20),
              reserved21(21), reserved22(22), reserved23(23),
              initiatorAndSelfOnly(24),
              targetAndSelfOnly(25),
              managementRegistrationScn(26),
              objectRemoved(27),
              objectAdded(28),
              objectUpdated(29),
              ddOrDdsMemberRemoved(30),
              ddOrDdsMemberAdded(31)
                           }

      IsnsFcPortRoleType ::= TEXTUAL-CONVENTION
```

```
          STATUS         current
          DESCRIPTION
        "The FC Port Role defines the functions of the registered
         object.  The definitions of each setting are defined in
         RFC 4171.
                     Bit          Port Role
                  ---------       ---------
                     29            Control
                     30            FCP Initiator
                     31            FCP Target
                  All others       RESERVED

         Setting a bit to 1 indicates the port has the corresponding
         characteristics.  The future assignment of any of the
         reserved values will be documented in a revision of
         RFC 4171."
          REFERENCE      "RFC 4171, Section 6.6.13"
          SYNTAX         BITS {
              reserved0(0), reserved1(1), reserved2(2),
              reserved3(3), reserved4(4), reserved5(5),
              reserved6(6), reserved7(7), reserved8(8),
              reserved9(9), reserved10(10), reserved11(11),
              reserved12(12), reserved13(13), reserved14(14),
              reserved15(15), reserved16(16), reserved17(17),
              reserved18(18), reserved19(19), reserved20(20),
              reserved21(21), reserved22(22), reserved23(23),
              reserved24(24), reserved25(25), reserved26(26),
              reserved27(27), reserved28(28),
              control(29),
              initiator(30),
              target(31)
                             }

        IsnsSrvrDiscoveryMethodsType ::= TEXTUAL-CONVENTION
          STATUS         current
          DESCRIPTION
        "The types of iSNS Server discovery methods that are enabled
         on an iSNS Server.  The options are DHCP, Service Location
         Protocol (SLP), multicast group iSNS heartbeat, broadcast
         group iSNS heartbeat, configured server list, and other.
         The iSNS Server may support additional discovery methods
         not indicated."
          REFERENCE      "RFC 4171, Section 2.5"
          SYNTAX         BITS {
                            dhcp(0),
                            slp(1),
                            multicastGroupHb(2),
                            broadcastHb(3),
```

```
                        cfgdServerList(4),
                        other(5)
                              }

    --
    -- Internet Storage Name Service Management
    --


    isnsNotifications           OBJECT IDENTIFIER ::=
                                    { isnsMIB 0 }
    isnsObjects                 OBJECT IDENTIFIER ::=
                                    { isnsMIB 1 }
    isnsConformance             OBJECT IDENTIFIER ::=
                                    { isnsMIB 2 }

    --
    -- iSNS Server instance managed objects --------------------
    --

    isnsServerInfo OBJECT IDENTIFIER ::= { isnsObjects 1 }

    isnsServerTable             OBJECT-TYPE
        SYNTAX                  SEQUENCE OF IsnsServerEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "This table provides a list of the iSNS Server instances
     that are managed through the same SNMP context."
        ::= { isnsServerInfo 1 }

    isnsServerEntry             OBJECT-TYPE
        SYNTAX                  IsnsServerEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "This is a row in the iSNS Server instance table.  The number
     of rows is dependent on the number of iSNS Server instances
     that are being managed through the same SNMP context."
        INDEX   { isnsServerIndex }
        ::= { isnsServerTable 1 }

    IsnsServerEntry ::=
        SEQUENCE {
           isnsServerIndex          Unsigned32,
           isnsServerName           SnmpAdminString,
           isnsServerIsnsVersion    Unsigned32,
           isnsServerVendorInfo     SnmpAdminString,
```

```
            isnsServerPhysicalIndex   PhysicalIndex,
            isnsServerTcpPort         InetPortNumber,
            isnsServerUdpPort         InetPortNumber,
            isnsServerDiscontinuityTime
                                      TimeStamp,
            isnsServerRole            INTEGER,
            isnsServerDiscoveryMethodsEnabled
                                      IsnsSrvrDiscoveryMethodsType,
            isnsServerDiscoveryMcGroupType
                                      InetAddressType,
            isnsServerDiscoveryMcGroupAddress
                                      InetAddress,
            isnsServerEsiNonResponseThreshold
                                      Unsigned32,
            isnsServerEnableControlNodeMgtScn
                                      TruthValue,
            isnsServerDefaultDdDdsStatus
                                      INTEGER,
            isnsServerUpdateDdDdsSupported
                                      IsnsDdDdsModificationType,
            isnsServerUpdateDdDdsEnabled
                                      IsnsDdDdsModificationType
                  }

      isnsServerIndex             OBJECT-TYPE
          SYNTAX                  Unsigned32 ( 1 .. 4294967295 )
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "This object uniquely identifies the iSNS Server being
       managed by the SNMP context and is the key for this table.
       This is an instance index for each iSNS Server being
       managed.  The value of this object is used elsewhere in
       the MIB to reference specific iSNS Servers."
          ::= { isnsServerEntry 1 }

      isnsServerName              OBJECT-TYPE
          SYNTAX                  SnmpAdminString
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "A non-unique name that can be assigned to the iSNS Server
       instance.  If not configured, then the string SHALL be
       zero-length."
          ::= { isnsServerEntry 2 }

      isnsServerIsnsVersion       OBJECT-TYPE
          SYNTAX                  Unsigned32 ( 0 .. 65535 )
```

```
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The iSNS version value as contained in messages received
     from the current primary server.  The header of each iSNSP
     message contains the iSNS version of the sender.  If
     unknown, the reported value is 0."
        REFERENCE               "RFC 4171"
        DEFVAL                  { 1 }
        ::= { isnsServerEntry 3 }

    isnsServerVendorInfo        OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "If this server instance is utilizing the product of a
     particular 'vendor', then this managed object contains
     that vendor's name and version.  Otherwise, the
     string SHALL be zero-length.  The format of the string
     is as follows: Vendor Name, Vendor Version, Vendor
     Defined Information.

           Field           Description
         ---------       ----------------
        Vendor Name      The name of the vendor (if one exists)
        Vendor Version   The version of the vendor product
        Vendor Defined   This follows the second comma in the
                         string, if one exists, and is vendor
                         defined
    "
        ::= { isnsServerEntry 4 }

    isnsServerPhysicalIndex     OBJECT-TYPE
        SYNTAX                  PhysicalIndex
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "An index identifying the network interface for this iSNS
     Server within a network entity.  This index maps to the
     entPhysicalIndex of entPhysicalTable table in RFC 4133.  The
     entPhysicalClass value for the table row must be 'port', as
     the interface must be able to send and receive data."
        REFERENCE           "RFC 4133, RFC 4171, Section 2.5 - 2.8"
        ::= { isnsServerEntry 5 }

    isnsServerTcpPort           OBJECT-TYPE
        SYNTAX                  InetPortNumber
```

```
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "Indicates the TCP port this iSNS instance is accepting
     iSNSP messages on, generally the iSNS well-known port.
     The well-known TCP port for iSNSP is 3205.  If TCP is
     not supported by this server instance, then the value
     is 0."
        ::= { isnsServerEntry 6 }

    isnsServerUdpPort           OBJECT-TYPE
        SYNTAX                  InetPortNumber
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "Indicates the UDP port this iSNS instance is accepting
     iSNSP messages on; generally, the iSNS well-known port.
     The well-known UDP port for iSNSP is 3205.  If UDP is
     not supported by this server instance, then the value
     is 0."
        ::= { isnsServerEntry 7 }

    isnsServerDiscontinuityTime OBJECT-TYPE
         SYNTAX                 TimeStamp
         MAX-ACCESS             read-only
         STATUS                 current
         DESCRIPTION
    "The value of sysUpTime on the most recent occasion that
     this iSNS server became active or suffered a
     discontinuity."
        ::= { isnsServerEntry 8 }

    isnsServerRole              OBJECT-TYPE
         SYNTAX                 INTEGER { notSet(1),
                                          server(2),
                                          backupServer(3) }
         MAX-ACCESS             read-only
         STATUS                 current
         DESCRIPTION
    "The current operational mode of this iSNS Server instance.

           Value            Description
          ---------        ----------------
           notSet          The iSNS Server role is not
                           configured.
           server          The iSNS Server instance is
                           an operational iSNS Server.
           backupServer    The iSNS Server instance is
```

```
                        currently acting as a backup."
    REFERENCE               "RFC 4171, Section 2.7 - 2.8"
    ::= { isnsServerEntry 9 }

isnsServerDiscoveryMethodsEnabled  OBJECT-TYPE
    SYNTAX                  IsnsSrvrDiscoveryMethodsType
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"Indicates the discovery methods currently enabled for
 this iSNS Server instance.  This allows a client to
 determine what discovery methods can be used for
 this iSNS Server.  Additional methods of discovery may
 also be supported."
    ::= { isnsServerEntry 10 }

isnsServerDiscoveryMcGroupType   OBJECT-TYPE
    SYNTAX                  InetAddressType
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"The type of Internet address in
 isnsServerDiscoveryMcGroupAddress.  If the address is
 specified, then it must be a valid multicast address and the
 value of this object must be ipv4(1), ipv6(2), ipv4z(3), or
 ipv6z(4); otherwise, the value of this object is
 unknown(0), and the value of
 isnsServerDiscoveryMcGroupAddress is the zero-length string."
    ::= { isnsServerEntry 11 }

isnsServerDiscoveryMcGroupAddress  OBJECT-TYPE
    SYNTAX                  InetAddress
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"The multicast group that iSNS Heartbeat messages are
 sent to if multicast-based discovery has been enabled
 for this server instance.  If not configured, then the
 string SHALL be zero-length.  The format of this
 object is specified by isnsServerDiscoveryMcGroupType."
    ::= { isnsServerEntry 12 }

isnsServerEsiNonResponseThreshold OBJECT-TYPE
    SYNTAX                  Unsigned32 ( 0 .. 65535 )
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"Entity Status Inquiry (ESI) Non-Response Threshold -
```

```
        the number of ESI messages that will be sent without
        receiving a response before an entity is deregistered
        from the iSNS database.  A value of 0 indicates
        Entities will never be deregistered due to non-receipt
        of ESI messages."
           REFERENCE "RFC 4171, Section 2.4"
           DEFVAL                  { 3 }
           ::= { isnsServerEntry 13 }

      isnsServerEnableControlNodeMgtScn  OBJECT-TYPE
           SYNTAX                  TruthValue
           MAX-ACCESS              read-only
           STATUS                  current
           DESCRIPTION
      "Indicates if the iSNS Server administrative option to send
        Management SCNs to Control Nodes is enabled.  Management
        SCNs are used by Control Nodes to monitor and control an
        iSNS Server.  If enabled, Control Nodes can register to
        receive Management SCNs."
           REFERENCE "RFC 4171, Section 2.2.3, 2.4"
           DEFVAL                  { true }
           ::= { isnsServerEntry 14 }

      isnsServerDefaultDdDdsStatus OBJECT-TYPE
           SYNTAX                  INTEGER { inNoDomain(1),
                                             inDefaultDdAndDds(2) }
           MAX-ACCESS              read-only
           STATUS                  current
           DESCRIPTION
      "This indicates the Discovery Domain (DD) and Discovery
        Domain Set (DDS) membership status for a new device
        when registered in the iSNS Server instance.  Either the
        new device will not be in a DD/DDS, or will be placed
        into a default DD and default DDS.  The default setting
        is inNoDomain."
           REFERENCE "RFC 4171, Section 2.4"
           DEFVAL                  { inNoDomain }
           ::= { isnsServerEntry 15 }

      isnsServerUpdateDdDdsSupported OBJECT-TYPE
           SYNTAX                  IsnsDdDdsModificationType
           MAX-ACCESS              read-only
           STATUS                  current
           DESCRIPTION
      "The methods that this iSNS Server instance supports
        to modify Discovery Domains and Discovery Domain Sets."
           REFERENCE  "RFC 4171, Section 2.4"
           ::= { isnsServerEntry 16 }
```

```
isnsServerUpdateDdDdsEnabled OBJECT-TYPE
    SYNTAX                  IsnsDdDdsModificationType
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"This indicates the methods this server instance currently
 allows for modifying Discovery Domains and Discovery
 Domain Sets."
    REFERENCE  "RFC 4171, Sec 2.2.2 and 2.4"
    ::= { isnsServerEntry 17 }

--
-- Count of objects currently registered in a server instance
--

isnsNumObjectsTable         OBJECT-TYPE
    SYNTAX                  SEQUENCE OF
                                IsnsNumObjectsEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"Table providing the number of registered objects of each
 type in the iSNS Server instance.  The number of entries is
 dependent upon the number of iSNS Server instances being
 managed."
    ::= { isnsServerInfo 2 }

isnsNumObjectsEntry         OBJECT-TYPE
    SYNTAX                  IsnsNumObjectsEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"Entry of an iSNS Server instance."
    AUGMENTS { isnsServerEntry }
     ::= { isnsNumObjectsTable 1 }

IsnsNumObjectsEntry ::= SEQUENCE  {
     isnsNumDds             Gauge32,
     isnsNumDd              Gauge32,
     isnsNumEntities        Gauge32,
     isnsNumPortals         Gauge32,
     isnsNumPortalGroups    Gauge32,
     isnsNumIscsiNodes      Gauge32,
     isnsNumFcPorts         Gauge32,
     isnsNumFcNodes         Gauge32
                                }
```

```
    isnsNumDds                  OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of Discovery Domain Sets
     in this iSNS instance.  This is the number of rows
     in the isnsDdsTable."
        ::= { isnsNumObjectsEntry 1 }

    isnsNumDd                   OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of Discovery Domains
     in this iSNS instance.  This is the number of rows in the
     isnsDdTable."
        ::= { isnsNumObjectsEntry 2 }

    isnsNumEntities             OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current number of Entities registered in this
     iSNS Server instance.  This is the number of rows in
     the isnsRegEntityTable for this instance."
        ::= { isnsNumObjectsEntry 3 }

    isnsNumPortals              OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of Portals registered in iSNS.
     This is the number of rows in isnsRegPortalTable."
        ::= { isnsNumObjectsEntry 4 }

    isnsNumPortalGroups         OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of Portal Groups registered in
     iSNS.  This is the number of rows in isnsRegPgTable."
        ::= { isnsNumObjectsEntry 5 }
```

```
    isnsNumIscsiNodes           OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of iSCSI node entries registered
     in the iSNS.  This is the number rows in
     isnsRegIscsiNodeTable."
        ::= { isnsNumObjectsEntry 6 }

    isnsNumFcPorts              OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of FC Port entries registered
     in the iSNS.  This is the number of rows in
     isnsRegFcPortTable."
        ::= { isnsNumObjectsEntry 7 }

    isnsNumFcNodes              OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The current total number of FC node entries registered
     in the iSNS.  This is the number of rows in
     isnsRegFcNodeTable."
        ::= { isnsNumObjectsEntry 8 }

    --
    -- Control node information
    --

    isnsControlNodeInfo     OBJECT IDENTIFIER ::=
                                        { isnsServerInfo 3 }

    --
    -- Specific iSCSI Nodes authorized to register as Control
    -- Nodes
    --

    isnsControlNodeIscsiTable   OBJECT-TYPE
        SYNTAX                  SEQUENCE OF
                                  IsnsControlNodeIscsiEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
```

```
      "Specified iSCSI Nodes that can register or are registered
       as control nodes.  The number of rows is dependent on the
       number of iSCSI Control Nodes."
          ::= { isnsControlNodeInfo 1 }

      isnsControlNodeIscsiEntry      OBJECT-TYPE
          SYNTAX                  IsnsControlNodeIscsiEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "This is an iSCSI Control Node entry for a specific iSNS
       server instance."
           INDEX          { isnsServerIndex,
                            isnsControlNodeIscsiNodeIndex }
           ::= { isnsControlNodeIscsiTable 1 }

      IsnsControlNodeIscsiEntry ::= SEQUENCE {
           isnsControlNodeIscsiNodeIndex     IsnsNodeIndexId,
           isnsControlNodeIscsiNodeName      SnmpAdminString,
           isnsControlNodeIscsiIsRegistered  TruthValue,
           isnsControlNodeIscsiRcvMgtSCN     TruthValue
                                          }

      isnsControlNodeIscsiNodeIndex  OBJECT-TYPE
          SYNTAX                  IsnsNodeIndexId
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "The index for the iSCSI storage node authorized to act
       as a control node."
           ::= { isnsControlNodeIscsiEntry 1 }

      isnsControlNodeIscsiNodeName   OBJECT-TYPE
          SYNTAX                  SnmpAdminString
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The iSCSI Name of the initiator or target associated with
       the storage node.  The iSCSI Name cannot be longer than
       223 bytes.  The iSNS Server internal maximum size is 224
       bytes to provide NULL termination.  This is the iSCSI Node
       Name for the storage node authorized and/or acting as a
       control node."
           ::= { isnsControlNodeIscsiEntry 2 }

      isnsControlNodeIscsiIsRegistered OBJECT-TYPE
          SYNTAX                  TruthValue
          MAX-ACCESS              read-only
```

```
        STATUS                  current
        DESCRIPTION
     "Indicates whether the control node is currently
      registered in the iSNS Server instance."
        ::= { isnsControlNodeIscsiEntry 3 }

    isnsControlNodeIscsiRcvMgtSCN  OBJECT-TYPE
        SYNTAX                  TruthValue
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
     "Indicates whether the Control Node has registered to
      receive Management SCNs.  Management SCNs are sent to
      a Control Node if they are enabled, as indicated by
      isnsServerEnableControlNodeMgtScn, and the Control
      Node has registered for them."
        REFERENCE "RFC 4171, Section 2.2.3, 2.4"
         ::= { isnsControlNodeIscsiEntry 4 }

    --
    -- Specific FC Ports authorized to register as Control
    -- Nodes
    --

    isnsControlNodeFcPortTable  OBJECT-TYPE
        SYNTAX                  SEQUENCE OF
                                  IsnsControlNodeFcPortEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "Specified FC Ports that can register or are registered as
     control nodes.  The number of rows is dependent on the
     number of FC Port Control Nodes."
        ::= { isnsControlNodeInfo 2 }

    isnsControlNodeFcPortEntry  OBJECT-TYPE
        SYNTAX                  IsnsControlNodeFcPortEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "FC Port control node entry."
         INDEX          { isnsServerIndex,
                          isnsControlNodeFcPortWwpn }
         ::= { isnsControlNodeFcPortTable 1 }

    IsnsControlNodeFcPortEntry ::= SEQUENCE  {
         isnsControlNodeFcPortWwpn          FcNameIdOrZero,
         isnsControlNodeFcPortIsRegistered  TruthValue,
```

```
          isnsControlNodeFcPortRcvMgtSCN     TruthValue
                                              }

      isnsControlNodeFcPortWwpn   OBJECT-TYPE
          SYNTAX                  FcNameIdOrZero (SIZE(8))
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "The FC Port World Wide Port Name that can and/or is acting
       as a Control Node for the specified iSNS Server.  A zero-
       length string is not valid for this managed object.
       This managed object, combined with the isnsServerIndex, is
       the key for this table."
           ::= { isnsControlNodeFcPortEntry 1 }

      isnsControlNodeFcPortIsRegistered OBJECT-TYPE
          SYNTAX                  TruthValue
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
       "Indicates whether the control node is currently
        registered in the iSNS Server instance."
           ::= { isnsControlNodeFcPortEntry 2 }

      isnsControlNodeFcPortRcvMgtSCN OBJECT-TYPE
          SYNTAX                  TruthValue
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
       "Indicates whether the Control Node has registered to
        receive Management SCNs.  Management SCNs are sent to
        a Control Node if they are enabled, as indicated by
        isnsServerEnableControlNodeMgtScn, and the Control
        Node has registered for them."
          REFERENCE "RFC 4171, Section 2.2.3, 2.4"
           ::= { isnsControlNodeFcPortEntry 3 }

      --
      -- Discovery Domain Set information
      --

      isnsDdsInfo     OBJECT IDENTIFIER ::= { isnsServerInfo 4 }

      --
      -- Discovery Domain Set Registrations -----------------
      --

      isnsDdsTable                OBJECT-TYPE
```

```
        SYNTAX                  SEQUENCE OF IsnsDdsEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "A table containing configuration information for each
     Discovery Domain Set (DDS) registered in the iSNS Server
     instance.  The number of rows in the table is dependent
     on the number of DDSs registered in the specified iSNS
     server instance."
        ::= { isnsDdsInfo 1 }

    isnsDdsEntry                OBJECT-TYPE
        SYNTAX                  IsnsDdsEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "Information on one Discovery Domain Set (DDS) registered
     in the iSNS Server instance."
        INDEX   { isnsServerIndex, isnsDdsId}
        ::= { isnsDdsTable 1 }

    IsnsDdsEntry ::=
        SEQUENCE {
           isnsDdsId             IsnsDiscoveryDomainSetId,
           isnsDdsSymbolicName   SnmpAdminString,
           isnsDdsStatus         IsnsDdsStatusType
                 }

    isnsDdsId                   OBJECT-TYPE
        SYNTAX                  IsnsDiscoveryDomainSetId
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "The ID that refers to this Discovery Domain Set and
     index to the table."
        ::= { isnsDdsEntry 1 }

    isnsDdsSymbolicName         OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Discovery Domain Set Symbolic Name field contains
     a unique variable-length description (up to 255 bytes)
     that is associated with the DDS.  If a Symbolic Name is
     not provided, then one will be generated by the iSNS
     server."
        REFERENCE "RFC 4171, Section 6"
```

```
        ::= { isnsDdsEntry 2 }

    isnsDdsStatus               OBJECT-TYPE
        SYNTAX                  IsnsDdsStatusType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The status of this Discovery Domain Set (DDS)."
        REFERENCE "RFC 4171, Section 6.11.1.3"
        ::= { isnsDdsEntry 3 }

    --
    -- Discovery Domain Set Members --------------------
    --

    --
    -- DDS Membership Assignment
    --

    isnsDdsMemberTable          OBJECT-TYPE
        SYNTAX                  SEQUENCE OF IsnsDdsMemberEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "A table containing Discovery Domains (DDs) that have
     been assigned to specific Discovery Domain Sets (DDSs).
     The number of rows in the table is dependent on the
     number of DD to DDS relationships in the iSNS instance."
        ::= { isnsDdsInfo 2 }


    isnsDdsMemberEntry          OBJECT-TYPE
        SYNTAX                  IsnsDdsMemberEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "The mapping of one Discovery Domain (DD) to a Discovery
     Domain Set (DDS).  This indicates the DD is a member of
     the DDS."
        INDEX   { isnsServerIndex,
                  isnsDdsId,
                  isnsDdsMemberDdId }
        ::= { isnsDdsMemberTable 1 }

    IsnsDdsMemberEntry ::=
        SEQUENCE {
           isnsDdsMemberDdId       IsnsDiscoveryDomainId,
           isnsDdsMemberSymbolicName SnmpAdminString
```

```
            }

    isnsDdsMemberDdId           OBJECT-TYPE
        SYNTAX                  IsnsDiscoveryDomainId
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "The ID that identifies the Discovery Domain
     that is a member of the Discovery Domain Set."
        ::= { isnsDdsMemberEntry 1 }

    isnsDdsMemberSymbolicName   OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Symbolic Name of the Discovery Domain that is a member
     of this DDS.  This value SHALL be identical to the object
     isnsDdSymbolicName for the associated DD ID."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdsMemberEntry 2 }

    --
    -- Discovery Domain information
    --

    isnsDdInfo     OBJECT IDENTIFIER ::= { isnsServerInfo 5 }

    --
    -- Discovery Domain Registrations ------------------------
    --

    isnsDdTable                 OBJECT-TYPE
        SYNTAX                  SEQUENCE OF IsnsDdEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "A table containing configuration information for each
     Discovery Domain (DD) registered in the iSNS.  The number
     of rows in the table is dependent on the number of DDs
     registered in the iSNS instance."
        ::= { isnsDdInfo 1 }

    isnsDdEntry                 OBJECT-TYPE
        SYNTAX                  IsnsDdEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
```

```
      "Information on a Discovery Domain (DD) registered in
       the iSNS Server instance."
          INDEX   { isnsServerIndex, isnsDdId}
          ::= { isnsDdTable 1 }

      IsnsDdEntry::=
          SEQUENCE {
             isnsDdId             IsnsDiscoveryDomainId,
             isnsDdSymbolicName   SnmpAdminString,
             isnsDdFeatures       IsnsDdFeatureType
                   }

      isnsDdId                    OBJECT-TYPE
          SYNTAX                  IsnsDiscoveryDomainId
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "The ID that refers to this Discovery Domain, and the
       index to the table."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsDdEntry 1 }

      isnsDdSymbolicName          OBJECT-TYPE
          SYNTAX                  SnmpAdminString
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The Discovery Domain Symbolic Name field contains a
       unique variable-length description (up to 255 bytes)
       that is associated with the DD."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsDdEntry 2 }

      isnsDdFeatures              OBJECT-TYPE
          SYNTAX                  IsnsDdFeatureType
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "This defines the features the Discovery Domain has."
          REFERENCE "RFC 4171, Section 6.11.2.9"
          ::= { isnsDdEntry 3 }
```

```
--
-- Discovery Domain Members --------------------
--

--
-- DD iSCSI Node Membership Assignment
--

isnsDdIscsiMemberTable      OBJECT-TYPE
    SYNTAX                  SEQUENCE OF
                              IsnsDdIscsiMemberEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"A table containing iSCSI node indexes that have been
 assigned to specific DDs in this iSNS Server instance.  The
 number of rows in the table is dependent on the number of
 relationships between iSCSI Nodes and DDs registered in the
 iSNS instance."
    ::= { isnsDdInfo 2 }

isnsDdIscsiMemberEntry      OBJECT-TYPE
    SYNTAX                  IsnsDdIscsiMemberEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"The mapping of one iSCSI Node to a Discovery Domain to
 indicate membership in the DD.  The indexes are the iSNS
 server instance, the DD ID of the Discovery Domain, and
 the iSCSI Node Index of the iSCSI Node."
    INDEX   { isnsServerIndex,
              isnsDdId,
              isnsDdIscsiMemberIndex }
    ::= { isnsDdIscsiMemberTable 1 }

IsnsDdIscsiMemberEntry::=
    SEQUENCE {
       isnsDdIscsiMemberIndex   IsnsNodeIndexId,
       isnsDdIscsiMemberName    SnmpAdminString,
       isnsDdIscsiMemberIsRegistered TruthValue
             }

isnsDdIscsiMemberIndex      OBJECT-TYPE
    SYNTAX                  IsnsNodeIndexId
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"The index for this member iSCSI node entry."
```

```
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdIscsiMemberEntry 1 }

    isnsDdIscsiMemberName       OBJECT-TYPE
        SYNTAX                  SnmpAdminString (SIZE (0..223))
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The iSCSI Name associated with the storage node.  The
     iSCSI Name cannot be longer than 223 bytes.  The iSNS
     server internal maximum size is 224 bytes to provide
     NULL termination.  This is the iSCSI Name for the storage
     node that is a member of the DD.  This value maps 1 to 1
     to the isnsDdIscsiMemberIndex node index.  The iSCSI Name
     field is too long to be easily used for an index directly.
     The node index used for a specific node name is only
     persistent across iSNS Server reinitializations for nodes
     that are in a Discovery Domain (DD) or are registered
     control nodes.  This value is only required during row
     creation if the storage node is not yet registered in the
     iSNS Server instance.  If the storage node is not yet
     registered, then the iSCSI Name MUST be provided with the
     iSCSI node index during row creation in order to create the
     1-to-1 mapping."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdIscsiMemberEntry 2 }

    isnsDdIscsiMemberIsRegistered OBJECT-TYPE
        SYNTAX                  TruthValue
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "This indicates whether this member of the DD is currently
     registered in the iSNS Server instance.  iSCSI Storage
     Node members do not need to be currently registered in
     order for their iSCSI Name and Index to be added to
     a DD."
        REFERENCE "RFC 4171, Section 6.11"
        ::= { isnsDdIscsiMemberEntry 3 }

    --
    -- DD Portal Membership Assignment
    --

    isnsDdPortalMemberTable     OBJECT-TYPE
        SYNTAX                  SEQUENCE OF
                                  IsnsDdPortalMemberEntry
        MAX-ACCESS              not-accessible
```

```
        STATUS                  current
        DESCRIPTION
    "A table containing currently registered and unregistered
     portal objects that have been explicitly assigned to
     specific DDs.  Explicit assignment of a portal to a DD
     is only done when a specific set of portals are preferred
     for use within a DD.  Otherwise, for iSCSI, the Portal
     Group Object should be used for identifying which portals
     provide access to which storage nodes.  The number of rows
     in the table is dependent on the number of explicit
     relationships between portals and DDs registered in the
     iSNS."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdInfo 3 }

    isnsDdPortalMemberEntry     OBJECT-TYPE
        SYNTAX                  IsnsDdPortalMemberEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "Each entry indicates an explicit addition of a portal to a
     discovery domain.  The explicit addition of an entity portal
     to a discovery domain indicates the portal is preferred for
     access to nodes of the entity for this discovery domain.
     Registered Portal Group objects are used in iSCSI to
     indicate mapping of portals to nodes across all discovery
     domains.  Portals that have been explicitly mapped to a
     discovery domain will be returned as part of a query that
     is scoped to that discovery domain.  If no portal of an
     entity has been explicitly mapped to a discovery domain,
     then all portals of the entity that provide access to a
     storage node are returned as part of a query.  The table
     indexes are the server instance, the DD ID of the Discovery
     Domain, and the Portal Index of the portal."
        INDEX   { isnsServerIndex,
                  isnsDdId,
                  isnsDdPortalMemberIndex }
        ::= { isnsDdPortalMemberTable 1 }

    IsnsDdPortalMemberEntry ::=
        SEQUENCE {
           isnsDdPortalMemberIndex        IsnsPortalIndexId,
           isnsDdPortalMemberAddressType  InetAddressType,
           isnsDdPortalMemberAddress      InetAddress,
           isnsDdPortalMemberPortType     IsnsPortalPortTypeId,
           isnsDdPortalMemberPort         InetPortNumber,
           isnsDdPortalMemberIsRegistered TruthValue
                 }
```

```
    isnsDdPortalMemberIndex     OBJECT-TYPE
        SYNTAX                  IsnsPortalIndexId
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "The index for a portal explicitly contained in the discovery
     domain.  This managed object, combined with isnsServerIndex
     and isnsDdId, is the key for this table."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdPortalMemberEntry 1 }

    isnsDdPortalMemberAddressType  OBJECT-TYPE
        SYNTAX                  InetAddressType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The type of Inet address in isnsDdPortalMemberAddress.  If
     the address is specified, then it must be a valid unicast
     address and the value of this object must be ipv4(1),
     ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value
     of this object is unknown(0), and the value of
     isnsDdPortalMemberAddress is the zero-length string."
        ::= { isnsDdPortalMemberEntry 2 }

    isnsDdPortalMemberAddress   OBJECT-TYPE
        SYNTAX                  InetAddress
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Inet Address for the portal.  The format of this
     object is specified by isnsDdPortalMemberAddressType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdPortalMemberEntry 3 }

    isnsDdPortalMemberPortType  OBJECT-TYPE
        SYNTAX                  IsnsPortalPortTypeId
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The port type for the portal, either UDP or TCP."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdPortalMemberEntry 4 }

    isnsDdPortalMemberPort      OBJECT-TYPE
        SYNTAX                  InetPortNumber ( 1 .. 65535 )
        MAX-ACCESS              read-only
        STATUS                  current
```

```
        DESCRIPTION
      "The port number for the portal.  Whether the portal
       type is TCP or UDP is indicated by
       isnsDdPortalMemberPortType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsDdPortalMemberEntry 5 }

      isnsDdPortalMemberIsRegistered OBJECT-TYPE
        SYNTAX                  TruthValue
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
      "This indicates whether this member of the DD is currently
       registered in the iSNS Server instance.  Portals that are
       DD members do not need to be currently registered in
       order for them to be added to a DD."
        REFERENCE "RFC 4171, Section 6.11"
        ::= { isnsDdPortalMemberEntry 6 }

      --
      -- DD FC Port Membership Assignment
      --

      isnsDdFcPortMemberTable     OBJECT-TYPE
        SYNTAX                  SEQUENCE OF
                                  IsnsDdFcPortMemberEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
      "A table containing FC Port World Wide Names (WWN) that
       have been assigned to specific DDs.  The number of rows
       in the table is dependent on the number of relationships
       between FC Ports and DDs registered in the iSNS."
        ::= { isnsDdInfo 4 }

      isnsDdFcPortMemberEntry     OBJECT-TYPE
        SYNTAX                  IsnsDdFcPortMemberEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
      "The association of one FC Port with a Discovery Domain.
       Membership of an FC Port in a Discovery Domain is
       indicated by creating a row for the appropriate DD ID
       and FC Port WWN."
        INDEX   { isnsServerIndex,
                  isnsDdId,
                  isnsDdFcPortMemberPortName }
        ::= { isnsDdFcPortMemberTable 1 }
```

```
IsnsDdFcPortMemberEntry ::=
    SEQUENCE {
       isnsDdFcPortMemberPortName FcNameIdOrZero,
       isnsDdFcPortMemberIsRegistered TruthValue
    }

isnsDdFcPortMemberPortName  OBJECT-TYPE
    SYNTAX                  FcNameIdOrZero (SIZE(8))
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"The Port WWN of the FC Port that is a member of the DD.  The
 value MUST be a valid FC WWN, as per the FC-GS (Fibre Channel -
 Generic Services) standard.  This managed object, combined
 with the isnsServerIndex and isnsDdId are the key for this
 table.  A zero-length string is not a valid value for this
 managed object."
    REFERENCE "RFC 4171, Section 6"
    ::= { isnsDdFcPortMemberEntry 1 }

isnsDdFcPortMemberIsRegistered OBJECT-TYPE
    SYNTAX                  TruthValue
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"This indicates whether this member of the DD is currently
 registered in the iSNS Server instance."
    REFERENCE "RFC 4171, Section 6.11"
    ::= { isnsDdFcPortMemberEntry 2 }

--
--  Registered Device Information
--

isnsReg    OBJECT IDENTIFIER ::= { isnsServerInfo 6 }

isnsRegEntityInfo           OBJECT IDENTIFIER
                               ::= { isnsReg    1 }

--
-- iSNS Registered Entities Table
--

isnsRegEntityTable          OBJECT-TYPE
    SYNTAX                  SEQUENCE OF IsnsRegEntityEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
```

```
        DESCRIPTION
      "A table containing registered Entity objects in each iSNS
       server instance.  The number of entries in the table is
       dependent on the number of Entity objects registered in the
       iSNS Server instances.  All Entity objects are registered in
       the iSNS using the iSNS protocol."
        ::= { isnsRegEntityInfo 1 }

      isnsRegEntityEntry          OBJECT-TYPE
        SYNTAX                    IsnsRegEntityEntry
        MAX-ACCESS                not-accessible
        STATUS                    current
        DESCRIPTION
      "Information on one registered Entity object in an iSNS
       server instance."
        INDEX   { isnsServerIndex,
                  isnsRegEntityIndex }
        ::= { isnsRegEntityTable 1 }

      IsnsRegEntityEntry ::=
        SEQUENCE {
           isnsRegEntityIndex          IsnsEntityIndexIdOrZero,
           isnsRegEntityEID            SnmpAdminString,
           isnsRegEntityProtocol       Unsigned32,
           isnsRegEntityManagementAddressType
                                       InetAddressType,
           isnsRegEntityManagementAddress
                                       InetAddress,
           isnsRegEntityTimestamp      TimeStamp,
           isnsRegEntityVersionMin     Unsigned32,
           isnsRegEntityVersionMax     Unsigned32,
           isnsRegEntityRegistrationPeriod
                                       Unsigned32
                }

      isnsRegEntityIndex          OBJECT-TYPE
        SYNTAX                    IsnsEntityIndexIdOrZero
                                       ( 1 .. 4294967295 )
        MAX-ACCESS                not-accessible
        STATUS                    current
        DESCRIPTION
      "The Entity Index for this entity.  This index is assigned
       by the iSNS Server when an Entity is initially registered.
       The Entity Index can be used to represent a registered
       Entity object in situations where the Entity EID would
       be too long/unwieldy.  Zero is not a valid value for this
       object."
        REFERENCE "RFC 4171, Section 6"
```

```
        ::= { isnsRegEntityEntry 1 }

    isnsRegEntityEID            OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The EID is a unique registered Entity object identifier, as
     specified in the iSNS Specification.  This is the iSNS
     Entity Identifier for the registered Entity object."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegEntityEntry 2 }

    isnsRegEntityProtocol       OBJECT-TYPE
        SYNTAX                  Unsigned32 ( 1 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The block storage protocol supported by this entity, as
     defined in the iSNS Specification, Section 6.2.2.  The
     following values are initially assigned.

               Type Value       Entity Type
               ----------       -----------
                  1             No Protocol
                  2             iSCSI
                  3             iFCP
                All Others      As assigned by IANA

     The full set of current Block Storage Protocols are
     specified in the IANA-maintained registry of assigned
     iSNS parameters.  Please refer to RFC 4171 and the iSNS
     parameters maintained at IANA."
        REFERENCE  "RFC 4171, Section 6.2.2, and IANA Assignments"
        ::= { isnsRegEntityEntry 3 }

    isnsRegEntityManagementAddressType OBJECT-TYPE
        SYNTAX                  InetAddressType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The type of Inet address in isnsRegEntityManagementAddress.
     If the address is specified, then it must be a valid unicast
     address and the value of this object must be ipv4(1),
     ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value of
     this object is unknown(0), and the value of
     isnsRegEntityManagementAddress is the zero-length string."
        ::= { isnsRegEntityEntry 4 }
```

```
    isnsRegEntityManagementAddress OBJECT-TYPE
        SYNTAX                  InetAddress
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The iSNS Management IP Address for the registered Entity
     object.  The format of this object is specified by
     isnsRegEntityManagementAddressType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegEntityEntry 5 }

    isnsRegEntityTimestamp      OBJECT-TYPE
        SYNTAX                  TimeStamp
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The iSNS Entity Registration Timestamp for the registered
     Entity object.  This is the most recent date and time that
     the registered Entity object, and associated registered
     objects contained in the Entity, were registered or
     updated."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegEntityEntry 6 }

    isnsRegEntityVersionMin     OBJECT-TYPE
        SYNTAX                  Unsigned32 ( 0 .. 254 | 255 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The minimum version supported for the block storage protocol
     specified by isnsRegEntityProtocol.  The protocol version
     specified can be from 1 to 254.  A value of 255 is a wildcard
     value, indicating no minimum version value has been specified
     for this Entity.  Entity registrations with an
     isnsRegEntityProtocol of 'No Protocol' SHALL have an
     isnsRegEntityVersionMin value of 0."
        REFERENCE "RFC 4171, Section 6.2.5"
        ::= { isnsRegEntityEntry 7 }

    isnsRegEntityVersionMax     OBJECT-TYPE
        SYNTAX                  Unsigned32 ( 0 .. 254 | 255 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The maximum version supported for the block storage protocol
     specified by isnsRegEntityProtocol.  The protocol version
     specified can be from 1 to 254.  A value of 255 is a wildcard
```

```
       value, indicating no maximum version value has been specified
       for this Entity.  Entity registrations with an
       isnsRegEntityProtocol of 'No Protocol' SHALL have an
       isnsRegEntityVersionMax value of 0."
          REFERENCE "RFC 4171, Section 6.2.5"
          ::= { isnsRegEntityEntry 8 }

      isnsRegEntityRegistrationPeriod OBJECT-TYPE
          SYNTAX                  Unsigned32 ( 0 .. 4294967295 )
          UNITS                   "seconds"
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The iSNS Entity Status Inquiry (ESI) registration period,
       which indicates the maximum time, in seconds, that the
       registration will be maintained without receipt of an iSNSP
       message from the entity.  If the Registration Period is set
       to 0, then the Entity SHALL NOT be deregistered due to no
       contact with the entity."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsRegEntityEntry 9 }

      --
      -- Registered Objects Associated With an Entity Information
      --

      isnsRegEntityNumObjectsTable    OBJECT-TYPE
          SYNTAX                  SEQUENCE OF
                                    IsnsRegEntityNumObjectsEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "A table containing information on the number of registered
       objects associated with a registered Entity in the iSNS
       server instance.  The number of entries in the table is
       dependent on the number of registered Entity objects in the
       iSNS."
          ::= { isnsRegEntityInfo 2 }

      isnsRegEntityNumObjectsEntry    OBJECT-TYPE
          SYNTAX                  IsnsRegEntityNumObjectsEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "Information on the number of registered objects associated
       with a registered Entity object in an iSNS Server instance."
          INDEX   { isnsServerIndex,
                    isnsRegEntityIndex }
```

```
        ::= { isnsRegEntityNumObjectsTable 1 }

    IsnsRegEntityNumObjectsEntry ::=
        SEQUENCE {
           isnsRegEntityInfoNumPortals      Gauge32,
           isnsRegEntityInfoNumPortalGroups Gauge32,
           isnsRegEntityInfoNumIscsiNodes   Gauge32,
           isnsRegEntityInfoNumFcPorts      Gauge32,
           isnsRegEntityInfoNumFcNodes      Gauge32
                }

    isnsRegEntityInfoNumPortals OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The number of Portals associated with this Entity."
        ::= { isnsRegEntityNumObjectsEntry 1 }

    isnsRegEntityInfoNumPortalGroups OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The number of Portal Groups associated with this Entity."
        ::= { isnsRegEntityNumObjectsEntry 2 }

    isnsRegEntityInfoNumIscsiNodes OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The number of iSCSI Storage Nodes associated with this
     Entity."
        ::= { isnsRegEntityNumObjectsEntry 3 }

    isnsRegEntityInfoNumFcPorts OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The number of FC Ports associated with this Entity."
        ::= { isnsRegEntityNumObjectsEntry 4 }

    isnsRegEntityInfoNumFcNodes OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
```

```
        DESCRIPTION
      "The number of FC Nodes associated with this Entity."
        ::= { isnsRegEntityNumObjectsEntry 5 }

      --
      -- iSNS Registered Portal Information
      --

      isnsRegPortalInfo           OBJECT IDENTIFIER
                                     ::= { isnsReg  2 }

      --
      -- iSNS Registered Portal Table
      --

      isnsRegPortalTable          OBJECT-TYPE
          SYNTAX                  SEQUENCE OF IsnsRegPortalEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "A table containing the registered Portals in the iSNS.
       The number of entries is dependent on the number of
       Portals registered in the iSNS."
          ::= { isnsRegPortalInfo 1 }

      isnsRegPortalEntry          OBJECT-TYPE
          SYNTAX                  IsnsRegPortalEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "Information on one registered Entity Portal in the iSNS.
       The Entity Index is part of the table index to quickly
       find Portals that support a specific Entity."
          INDEX   { isnsServerIndex,
                    isnsRegEntityIndex,
                    isnsRegPortalPortalIndex }
          ::= { isnsRegPortalTable 1 }

      IsnsRegPortalEntry ::=
          SEQUENCE {
             isnsRegPortalPortalIndex    IsnsPortalIndexId,
             isnsRegPortalAddressType    InetAddressType,
             isnsRegPortalAddress        InetAddress,
             isnsRegPortalPortType       IsnsPortalPortTypeId,
             isnsRegPortalPort           InetPortNumber,
             isnsRegPortalSymbolicName   SnmpAdminString,
             isnsRegPortalEsiInterval    Unsigned32,
             isnsRegPortalEsiPortType    IsnsPortalPortTypeId,
```

```
            isnsRegPortalEsiPort        InetPortNumber,
            isnsRegPortalScnPortType    IsnsPortalPortTypeId,
            isnsRegPortalScnPort        InetPortNumber,
            isnsRegPortalSecurityInfo   IsnsPortalSecurityType
                 }

       isnsRegPortalPortalIndex    OBJECT-TYPE
           SYNTAX                  IsnsPortalIndexId
           MAX-ACCESS              not-accessible
           STATUS                  current
           DESCRIPTION
       "The index for this Entity Portal."
           REFERENCE "RFC 4171, Section 6"
           ::= { isnsRegPortalEntry 1 }

       isnsRegPortalAddressType    OBJECT-TYPE
           SYNTAX                  InetAddressType
           MAX-ACCESS              read-only
           STATUS                  current
           DESCRIPTION
       "The type of Inet address in isnsRegPortalAddress.  If the
        address is specified, then it must be a valid unicast
        address and the value of this object must be ipv4(1),
        ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value
        of this object is unknown(0), and the value of
        isnsRegPortalAddress is the zero-length string."
           ::= { isnsRegPortalEntry 2 }

       isnsRegPortalAddress        OBJECT-TYPE
           SYNTAX                  InetAddress
           MAX-ACCESS              read-only
           STATUS                  current
           DESCRIPTION
       "The Inet Address for this Portal as defined in the iSNS
        Specification, RFC 4171.  The format of this object is
        specified by isnsRegPortalAddressType."
           REFERENCE "RFC 4171, Section 6"
           ::= { isnsRegPortalEntry 3 }

       isnsRegPortalPortType       OBJECT-TYPE
           SYNTAX                  IsnsPortalPortTypeId
           MAX-ACCESS              read-only
           STATUS                  current
           DESCRIPTION
       "The port type for this Portal, either UDP or TCP, as
        defined in the iSNS Specification, RFC 4171."
           REFERENCE "RFC 4171, Section 6"
           ::= { isnsRegPortalEntry 4 }
```

```
    isnsRegPortalPort           OBJECT-TYPE
        SYNTAX                  InetPortNumber ( 1 .. 65535 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The port number for this Portal as defined in the
     iSNS Specification, RFC 4171.  Whether the Portal type
     is TCP or UDP is indicated by isnsRegPortalPortType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPortalEntry 5 }

    isnsRegPortalSymbolicName   OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Symbolic Name for this Portal as defined in the iSNS
     Specification, RFC 4171.  If not provided, then the string
     SHALL be zero-length."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPortalEntry 6 }

    isnsRegPortalEsiInterval    OBJECT-TYPE
        SYNTAX                  Unsigned32 ( 0 .. 65535 )
        UNITS                   "seconds"
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Entity Status Inquiry (ESI) Interval for this Portal
     as defined in the iSNS Specification, RFC 4171.  A value of
     0 indicates that ESI monitoring has not been configured for
     this Portal."
        REFERENCE "RFC 4171, Section 6.3.4"
        ::= { isnsRegPortalEntry 7 }

    isnsRegPortalEsiPortType    OBJECT-TYPE
        SYNTAX                  IsnsPortalPortTypeId
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The port type for the ESI Port, either UDP or TCP, as
     defined in the iSNS Specification, RFC 4171."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPortalEntry 8 }

    isnsRegPortalEsiPort        OBJECT-TYPE
        SYNTAX                  InetPortNumber
```

```
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The TCP or UDP port number used for ESI monitoring.  Whether
     the port type is TCP or UDP is indicated by
     isnsRegPortalEsiPortType.  A value of 0 indicates that ESI
     monitoring is not enabled for this Portal."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPortalEntry 9 }

    isnsRegPortalScnPortType    OBJECT-TYPE
        SYNTAX                  IsnsPortalPortTypeId
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The port type for the SCN Port, either UDP or TCP, as
     defined in the iSNS Specification, RFC 4171."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPortalEntry 10 }

    isnsRegPortalScnPort        OBJECT-TYPE
        SYNTAX                  InetPortNumber
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The TCP or UDP port used to receive SCN messages from the
     iSNS Server.  Whether the port type is TCP or UDP is
     indicated by isnsRegPortalScnPortType.  A value of 0
     indicates that SCN message receipt is not enabled for this
     Portal."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPortalEntry 11 }

    isnsRegPortalSecurityInfo   OBJECT-TYPE
        SYNTAX                  IsnsPortalSecurityType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "Indicates security attribute settings for the Portal as
     registered in the iSNS server.  The bit for bitmapVALID must
     be set in order for this attribute to contain valid
     information.  Setting a bit to 1 indicates the
     feature is enabled."
        REFERENCE "RFC 4171, Section 6.3.9"
        ::= { isnsRegPortalEntry 12 }
```

```
--
-- iSNS Registered Portal Group Information
--

isnsRegPortalGroupInfo      OBJECT IDENTIFIER
                               ::= { isnsReg  3 }

--
-- iSNS Registered Portal Group (PG) Table
--

isnsRegPgTable              OBJECT-TYPE
    SYNTAX                  SEQUENCE OF IsnsRegPgEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"A table containing the registered Portal Groups (PGs) in
 the iSNS Server instance.  The number of entries is
 dependent on the number of Portal Groups registered in
 the iSNS."
    ::= { isnsRegPortalGroupInfo 1 }

isnsRegPgEntry              OBJECT-TYPE
    SYNTAX                  IsnsRegPgEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"Information on one registered Portal Group in the iSNS
 server instance.  The Entity Index is part of the table
 index to quickly find Portal Groups that support Portals
 and iSCSI Storage Nodes in a specific Entity."
    INDEX   { isnsServerIndex,
              isnsRegEntityIndex,
              isnsRegPgIndex }
    ::= { isnsRegPgTable 1 }

IsnsRegPgEntry ::=
    SEQUENCE {
       isnsRegPgIndex              IsnsPortalGroupIndexId,
       isnsRegPgIscsiNodeIndex     IsnsNodeIndexId,
       isnsRegPgIscsiName          SnmpAdminString,
       isnsRegPgPortalPortalIndex  IsnsPortalIndexId,
       isnsRegPgPortalAddressType  InetAddressType,
       isnsRegPgPortalAddress      InetAddress,
       isnsRegPgPortalPortType     IsnsPortalPortTypeId,
       isnsRegPgPortalPort         InetPortNumber,
       isnsRegPgPGT                IsnsPortalGroupTagIdOrNull
             }
```

```
      isnsRegPgIndex              OBJECT-TYPE
          SYNTAX                  IsnsPortalGroupIndexId
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "The PG Index for this node.  The index is created by the
       iSNS Server instance for uniquely identifying registered
       objects.  The PG object is registered at the same time a
       Portal or Storage Node is registered using the iSNS
       protocol."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsRegPgEntry 1 }

      isnsRegPgIscsiNodeIndex     OBJECT-TYPE
          SYNTAX                  IsnsNodeIndexId
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The index for the iSCSI Node associated with this PG.
       This index can be used to reference the
       isnsRegIscsiNodeTable."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsRegPgEntry 2 }

      isnsRegPgIscsiName          OBJECT-TYPE
          SYNTAX                  SnmpAdminString (SIZE (0..223))
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The iSCSI Name of the initiator or target associated with
       the storage node.  The iSCSI Name cannot be longer than
       223 bytes.  The iSNS Server internal maximum size is 224
       bytes to provide NULL termination.  This is the PG iSCSI
       Name that uniquely identifies the iSCSI Storage Node that
       is associated with this PG."
          ::= { isnsRegPgEntry 3 }

      isnsRegPgPortalPortalIndex  OBJECT-TYPE
          SYNTAX                  IsnsPortalIndexId
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The Portal Index for the Portal associated with this PG.
       This index can be used to reference the isnsRegPortalTable."
          ::= { isnsRegPgEntry 4 }

      isnsRegPgPortalAddressType  OBJECT-TYPE
```

```
        SYNTAX                  InetAddressType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The type of Inet address in isnsRegPgPortalAddress.  If
     the address is specified, then it must be a valid unicast
     address and the value of this object must be ipv4(1),
     ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value
     of this object is unknown(0), and the value of
     isnsRegPgPortalAddress is the zero-length string."
        ::= { isnsRegPgEntry 5 }

    isnsRegPgPortalAddress      OBJECT-TYPE
        SYNTAX                  InetAddress
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Inet Address for the Portal that is associated with
     the PG.  The format of this object is specified by
     isnsRegPgPortalAddressType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPgEntry 6 }

    isnsRegPgPortalPortType     OBJECT-TYPE
        SYNTAX                  IsnsPortalPortTypeId
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The port type, either UDP or TCP, for the Portal that
     is associated with this registered PG object."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPgEntry 7 }

    isnsRegPgPortalPort         OBJECT-TYPE
        SYNTAX                  InetPortNumber ( 1 .. 65535 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The port number for the Portal that is associated with
     this registered PG object.  Whether the Portal type is
     TCP or UDP is indicated by isnsRegPgPortalPortType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegPgEntry 8 }

    isnsRegPgPGT                OBJECT-TYPE
        SYNTAX                  IsnsPortalGroupTagIdOrNull
        MAX-ACCESS              read-only
        STATUS                  current
```

```
        DESCRIPTION
      "The Portal Group Tag (PGT) for the registered iSCSI Portal
       Group object in an iSNS Server instance.  This indicates
       the tag value that the Portal uses for access to the iSCSI
       Storage Node.  The PGT is used for coordinated access
       between multiple Portals, as described in the iSCSI
       Specification, RFC 3720.  A PGT with no association is a
       NULL value.  The value of -1 indicates a NULL value."
          REFERENCE "RFC 4171, Section 6, and RFC 3720"
          ::= { isnsRegPgEntry 9 }

      --
      -- iSNS Registered iSCSI Node Information
      --

      isnsRegIscsiNodeInfo  OBJECT IDENTIFIER ::= { isnsReg  4 }

      --
      -- iSNS Registered iSCSI Node Table
      --

      isnsRegIscsiNodeTable       OBJECT-TYPE
          SYNTAX                  SEQUENCE OF IsnsRegIscsiNodeEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "A table containing the registered iSCSI Nodes in the iSNS
       server instance.  Storage devices register using the iSNS
       protocol.  While a device cannot be registered in an iSNS
       server using SNMP, an entry can be deleted in order to
       remove 'stale' entries.  The number of entries is related
       to the number of iSCSI nodes registered in the iSNS."
          ::= { isnsRegIscsiNodeInfo 1 }

      isnsRegIscsiNodeEntry       OBJECT-TYPE
          SYNTAX                  IsnsRegIscsiNodeEntry
          MAX-ACCESS              not-accessible
          STATUS                  current
          DESCRIPTION
      "Information on one iSCSI node that has been registered in
       the iSNS Server instance.  New rows cannot be added using
       SNMP."
          INDEX { isnsServerIndex,
                  isnsRegEntityIndex,
                  isnsRegIscsiNodeIndex }
          ::= { isnsRegIscsiNodeTable 1 }

      IsnsRegIscsiNodeEntry ::= SEQUENCE {
```

```
        isnsRegIscsiNodeIndex          IsnsNodeIndexId,
        isnsRegIscsiNodeName           SnmpAdminString,
        isnsRegIscsiNodeType           IsnsIscsiNodeType,
        isnsRegIscsiNodeAlias          SnmpAdminString,
        isnsRegIscsiNodeScnTypes       IsnsIscsiScnType,
        isnsRegIscsiNodeWwnToken       FcNameIdOrZero,
        isnsRegIscsiNodeAuthMethod     SnmpAdminString
                                    }

    isnsRegIscsiNodeIndex       OBJECT-TYPE
        SYNTAX                  IsnsNodeIndexId
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "The index for this iSCSI node."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegIscsiNodeEntry 1 }

    isnsRegIscsiNodeName        OBJECT-TYPE
        SYNTAX                  SnmpAdminString (SIZE (0..223))
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The iSCSI Name of the initiator or target associated with
     the storage node.  The iSCSI Name cannot be longer than
     223 bytes.  The iSNS Server internal maximum size is 224
     bytes to provide NULL termination.  This is the iSCSI Name
     that uniquely identifies the initiator, initiator/target,
     target, or control node in the network."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegIscsiNodeEntry 2 }

    isnsRegIscsiNodeType        OBJECT-TYPE
        SYNTAX                  IsnsIscsiNodeType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Node Type defining the functions of this iSCSI node."
        ::= { isnsRegIscsiNodeEntry 3 }

    isnsRegIscsiNodeAlias       OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Alias name of the iSCSI node.  This is a variable-length
     text-based description of up to 255 bytes."
        REFERENCE "RFC 4171, Section 6"
```

```
        ::= { isnsRegIscsiNodeEntry 4 }

    isnsRegIscsiNodeScnTypes    OBJECT-TYPE
        SYNTAX                  IsnsIscsiScnType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The State Change Notification (SCN) types enabled for this
     iSCSI node."
        REFERENCE "RFC 4171, Section 6.4.4"
        ::= { isnsRegIscsiNodeEntry 5 }

    isnsRegIscsiNodeWwnToken    OBJECT-TYPE
        SYNTAX                  FcNameIdOrZero
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "This contains a globally unique 64-bit integer value that
     can be used to represent the World Wide Node Name of the
     iSCSI device in a Fibre Channel fabric.  This identifier is
     used during the device registration process, and MUST
     conform to the requirements in RFC 4171.  A zero-length string
     for this managed object indicates that a Node WWN token has
     not been assigned."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegIscsiNodeEntry 6 }

    isnsRegIscsiNodeAuthMethod  OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "This attribute contains a null-terminated string containing
     UTF-8 text listing the iSCSI authentication methods enabled
     for this iSCSI Node, in order of preference.  The text
     values used to identify iSCSI authentication methods are
     embedded in this string attribute and delineated by a
     comma.  The text values are identical to those found in
     RFC 3720 - iSCSI.  Additional vendor-specific text values
     are also possible."
        REFERENCE "RFC 4171, Section 6, and RFC 3720"
        ::= { isnsRegIscsiNodeEntry 7 }

    --
    -- iSNS Registered FC Node Information
    --

    isnsRegFcNodeInfo     OBJECT IDENTIFIER ::= { isnsReg  5 }
```

```
--
-- iSNS Registered FC Node Table
--

isnsRegFcNodeTable          OBJECT-TYPE
    SYNTAX                  SEQUENCE OF IsnsRegFcNodeEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"A table containing the registered FC Nodes in the iSNS.
 This supports iFCP as defined in RFC 4172."
    ::= { isnsRegFcNodeInfo 1 }

isnsRegFcNodeEntry          OBJECT-TYPE
    SYNTAX                  IsnsRegFcNodeEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"Information on one registered FC node that has been
 registered in the iSNS."
    INDEX { isnsServerIndex,
            isnsRegFcNodeWwnn }
    ::= { isnsRegFcNodeTable 1 }

IsnsRegFcNodeEntry ::= SEQUENCE {
    isnsRegFcNodeWwnn           FcNameIdOrZero,
    isnsRegFcNodeSymbolicName   SnmpAdminString,
    isnsRegFcNodeAddressType    InetAddressType,
    isnsRegFcNodeAddress        InetAddress,
    isnsRegFcNodeIPA            OCTET STRING,
    isnsRegFcNodeProxyIscsiName SnmpAdminString,
    isnsRegFcNodeNumFcPorts     Gauge32
                                }

isnsRegFcNodeWwnn           OBJECT-TYPE
    SYNTAX                  FcNameIdOrZero (SIZE(8))
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"The FC Node World Wide Node Name as defined in the iSNS
 Specification, RFC 4171.  A zero-length string is not valid
 for this managed object."
    REFERENCE "RFC 4171, Section 6"
    ::= { isnsRegFcNodeEntry 1 }

isnsRegFcNodeSymbolicName   OBJECT-TYPE
    SYNTAX                  SnmpAdminString
```

```
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
      "The FC Node Symbolic Name of the node as defined in the
       iSNS Specification, RFC 4171.  This is a variable-length
       text-based description.  If not provided, then the string
       SHALL be zero-length."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegFcNodeEntry 2 }

    isnsRegFcNodeAddressType    OBJECT-TYPE
        SYNTAX                  InetAddressType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
      "The type of Inet address in isnsRegFcNodeAddress.  If
       the address is specified, then it must be a valid unicast
       address and the value of this object must be ipv4(1),
       ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value
       of this object is unknown(0), and the value of
       isnsRegFcNodeAddress is the zero-length string."
        ::= { isnsRegFcNodeEntry 3 }

    isnsRegFcNodeAddress        OBJECT-TYPE
        SYNTAX                  InetAddress
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
      "The FC Node Inet address of the node as defined in the
       iSNS Specification, RFC 4171.  The format of this object is
       specified by isnsRegFcNodeAddressType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegFcNodeEntry 4 }

    isnsRegFcNodeIPA            OBJECT-TYPE
        SYNTAX                  OCTET STRING (SIZE(8))
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
      "This managed object identifies the FC Initial Process
       Associator of the node as defined in the iSNS
       Specification, RFC 4171."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegFcNodeEntry 5 }

    isnsRegFcNodeProxyIscsiName OBJECT-TYPE
        SYNTAX                  SnmpAdminString (SIZE (0..223))
        MAX-ACCESS              read-only
```

```
        STATUS                  current
        DESCRIPTION
    "The iSCSI Name used to represent the FC Node in the IP
     network.  It is used as a pointer to the matching iSCSI Name
     entry in the iSNS Server.  Its value is usually registered
     by an FC-iSCSI gateway connecting the IP network to the
     fabric containing the FC device."
        REFERENCE  "RFC 4171, Section 6"
        ::= { isnsRegFcNodeEntry 6 }

    isnsRegFcNodeNumFcPorts     OBJECT-TYPE
        SYNTAX                  Gauge32 ( 0 .. 4294967295 )
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The number of FC Ports associated with this FC Node."
        ::= { isnsRegFcNodeEntry 7 }

    --
    -- iSNS Registered FC Port Table
    --

    isnsRegFcPortTable          OBJECT-TYPE
        SYNTAX                  SEQUENCE OF IsnsRegFcPortEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "Information on registered FC N_Ports in the iSNS.  FC Ports
     are associated with registered FC Nodes.  This supports
     iFCP as defined in RFC 4172."
        REFERENCE "RFC 4172, Section 4"
        ::= { isnsRegFcNodeInfo 2 }

    isnsRegFcPortEntry          OBJECT-TYPE
        SYNTAX                   IsnsRegFcPortEntry
        MAX-ACCESS              not-accessible
        STATUS                  current
        DESCRIPTION
    "Information on one FC Port that has been registered in
     iSNS."
        REFERENCE "RFC 4172, Section 4"
        INDEX { isnsServerIndex,
                isnsRegEntityIndex,
                isnsRegFcPortWwpn }
        ::= { isnsRegFcPortTable 1 }

    IsnsRegFcPortEntry ::= SEQUENCE {
        isnsRegFcPortWwpn              FcNameIdOrZero,
```

```
        isnsRegFcPortID               FcAddressIdOrZero,
        isnsRegFcPortType             Unsigned32,
        isnsRegFcPortSymbolicName     SnmpAdminString,
        isnsRegFcPortFabricPortWwn    FcNameIdOrZero,
        isnsRegFcPortHA               FcAddressIdOrZero,
        isnsRegFcPortAddressType      InetAddressType,
        isnsRegFcPortAddress          InetAddress,
        isnsRegFcPortFcCos            IsnsFcClassOfServiceType,
        isnsRegFcPortFc4Types         OCTET STRING,
        isnsRegFcPortFc4Descr         SnmpAdminString,
        isnsRegFcPortFc4Features      OCTET STRING,
        isnsRegFcPortScnTypes         IsnsIfcpScnType,
        isnsRegFcPortRole             IsnsFcPortRoleType,
        isnsRegFcPortFcNodeWwnn       FcNameIdOrZero,
        isnsRegFcPortPpnWwn           FcNameIdOrZero
                                   }

    isnsRegFcPortWwpn          OBJECT-TYPE
        SYNTAX                 FcNameIdOrZero (SIZE(8))
        MAX-ACCESS             not-accessible
        STATUS                 current
        DESCRIPTION
    "The FC Port's World Wide Port Name as defined in the iSNS
     Specification, RFC 4171.  A zero-length string is not valid
     for this managed object."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegFcPortEntry 1 }

    isnsRegFcPortID            OBJECT-TYPE
        SYNTAX                 FcAddressIdOrZero
        MAX-ACCESS             read-only
        STATUS                 current
        DESCRIPTION
    "The FC Port's Port ID as defined in the iSNS Specification,
     RFC 4171."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegFcPortEntry 2 }

    isnsRegFcPortType          OBJECT-TYPE
        SYNTAX                 Unsigned32 ( 0 .. 65535 )
        MAX-ACCESS             read-only
        STATUS                 current
        DESCRIPTION
    "The FC Port Type as defined in the iSNS Specification,
     RFC 4171, and the Fibre Channel Generic Services
     Specification.  Current values are as shown below:
            unknown      (0),
            nPort        (1),
```

```
            nlPort       (2),
            fNlPort      (3),
            fPort        (129),     -- x'81'
            flPort       (130),     -- x'82'
            ePort        (132),     -- x'84'
            bPort        (133),     -- x'85'
            mFcpPort     (65297),   -- x'FF11'
            iFcpPort     (65298),   -- x'FF12'
            unknownEnd   (65535)
         The future assignment of any additional values will be
         documented in a revision of RFC 4171."
            REFERENCE "RFC 4171, Section 6.6.3"
            ::= { isnsRegFcPortEntry 3 }

        isnsRegFcPortSymbolicName OBJECT-TYPE
            SYNTAX                SnmpAdminString
            MAX-ACCESS            read-only
            STATUS                current
            DESCRIPTION
        "The FC Port Symbolic Name as defined in the iSNS
         Specification, RFC 4171.  If not provided, then the
         string SHALL be zero-length."
            REFERENCE "RFC 4171, Section 6"
            ::= { isnsRegFcPortEntry 4 }

        isnsRegFcPortFabricPortWwn  OBJECT-TYPE
            SYNTAX                  FcNameIdOrZero
            MAX-ACCESS              read-only
            STATUS                  current
            DESCRIPTION
        "The Fabric Port WWN for this entry as defined in the iSNS
         Specification, RFC 4171.  A zero-length string for this
         managed object indicates that the Fabric Port WWN is not
         known, or has not yet been registered with the iSNS Server."
            REFERENCE "RFC 4171, Section 6"
           ::= { isnsRegFcPortEntry 5 }

        isnsRegFcPortHA             OBJECT-TYPE
            SYNTAX                  FcAddressIdOrZero
            MAX-ACCESS              read-only
            STATUS                  current
            DESCRIPTION
        "The FC Port Hard Address as defined in the iSNS
         Specification, RFC 4171."
            REFERENCE "RFC 4171, Section 6"
            ::= { isnsRegFcPortEntry 6 }

        isnsRegFcPortAddressType    OBJECT-TYPE
```

```
        SYNTAX                  InetAddressType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The type of Inet address in isnsRegFcPortAddress.  If
     the address is specified, then it must be a valid unicast
     address and the value of this object must be ipv4(1),
     ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value
     of this object is unknown(0), and the value of
     isnsRegFcPortAddress is the zero-length string."
        ::= { isnsRegFcPortEntry 7 }

    isnsRegFcPortAddress        OBJECT-TYPE
        SYNTAX                  InetAddress
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The FC Port Inet Address as defined in the iSNS
     Specification, RFC 4171.  The format of this object is
     specified by isnsRegFcPortAddressType."
        REFERENCE "RFC 4171, Section 6"
        ::= { isnsRegFcPortEntry 8 }

    isnsRegFcPortFcCos          OBJECT-TYPE
        SYNTAX                  IsnsFcClassOfServiceType
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The FC Port Class of Service as defined in the iSNS
     Specification, RFC 4171."
        REFERENCE  "RFC 4171, Section 6"
        ::= { isnsRegFcPortEntry 9 }

    isnsRegFcPortFc4Types       OBJECT-TYPE
        SYNTAX                  OCTET STRING (SIZE (32))
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The FC Port FC-4 Types as defined in the iSNS
     Specification, RFC 4171."
        REFERENCE "RFC 4171, Section 6.6.9"
        ::= { isnsRegFcPortEntry 10 }

    isnsRegFcPortFc4Descr       OBJECT-TYPE
        SYNTAX                  SnmpAdminString (SIZE(4..255))
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
```

```
      "The FC Port FC-4 Descriptor as defined in the iSNS
       Specification, RFC 4171.  The FC-4 Descriptor cannot be
       longer than 255 bytes.  The iSNS Server internal maximum
       size is 256 bytes to provide NULL termination."
           REFERENCE "RFC 4171, Section 6.6.10"
         ::= { isnsRegFcPortEntry 11 }

      isnsRegFcPortFc4Features    OBJECT-TYPE
          SYNTAX                  OCTET STRING (SIZE (128))
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The FC Port FC-4 Features as defined in the iSNS
       Specification, RFC 4171."
          REFERENCE "RFC 4171, Section 6.6.11"
          ::= { isnsRegFcPortEntry 12 }

      isnsRegFcPortScnTypes       OBJECT-TYPE
          SYNTAX                  IsnsIfcpScnType
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The iFCP State Change Notification (SCN) types enabled for
       the registered object."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsRegFcPortEntry 13 }

      isnsRegFcPortRole           OBJECT-TYPE
          SYNTAX                  IsnsFcPortRoleType
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The FC Port Role defines the role of the registered
       object."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsRegFcPortEntry 14 }

      isnsRegFcPortFcNodeWwnn     OBJECT-TYPE
          SYNTAX                  FcNameIdOrZero
          MAX-ACCESS              read-only
          STATUS                  current
          DESCRIPTION
      "The FC Node World Wide Node Name that is associated with
       this FC Port as defined in the iSNS Specification, RFC 4171.
       This managed object may contain a zero-length string prior
       to a device registering this value with the iSNS Server."
          REFERENCE "RFC 4171, Section 6"
          ::= { isnsRegFcPortEntry 15 }
```

```
isnsRegFcPortPpnWwn         OBJECT-TYPE
    SYNTAX                  FcNameIdOrZero
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
"The Permanent Port Name (PPN) attribute is the FC Port Name WWPN
 of the first Storage Node registered in the iSNS Database
 that is associated with a particular FC Device (FC Node).
 The PPN of all subsequent Storage Node registrations that
 are associated with that FC Device (FC Node) SHALL be set
 to the FC Port Name WWPN of the first Storage Node, as
 defined in the iSNS Specification, RFC 4171.  This managed
 object may contain a zero-length string prior to a device
 registering this value with the iSNS Server."
    REFERENCE "RFC 4171, Section 6"
    ::= { isnsRegFcPortEntry 16 }

--
--  Mapping from FC Node to Entity - FC Port
--

isnsRegFcNodePortTable      OBJECT-TYPE
    SYNTAX                  SEQUENCE OF
                              IsnsRegFcNodePortEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"A table containing the mapping of a registered FC Node and
 associated registered iFCP Port to the supporting registered
 Entity object in an iSNS Server instance."
    ::= { isnsRegFcNodeInfo 3 }

isnsRegFcNodePortEntry      OBJECT-TYPE
    SYNTAX                  IsnsRegFcNodePortEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
"Information on one mapping from an FC Node and iFCP Port to
 an Entity object registered in an iSNS."
    INDEX { isnsServerIndex,
            isnsRegFcNodeWwnn,
            isnsRegFcPortWwpn }
    ::= { isnsRegFcNodePortTable 1 }

IsnsRegFcNodePortEntry ::= SEQUENCE {
        isnsRegFcNodePortEntityIndex IsnsEntityIndexIdOrZero
                                     }
```

```
    isnsRegFcNodePortEntityIndex OBJECT-TYPE
        SYNTAX                  IsnsEntityIndexIdOrZero
        MAX-ACCESS              read-only
        STATUS                  current
        DESCRIPTION
    "The Entity Index for the registered Entity object
     associated with the FC Port and FC Node.  This managed
     object may contain the value of zero prior to a device
     registering this value with the iSNS Server."
        ::= { isnsRegFcNodePortEntry 1 }

    --
    -- iSNS Notifications Information -----------------
    --

    isnsNotificationsInfo        OBJECT IDENTIFIER
                                      ::= { isnsObjects 2 }

    isnsInstanceInfo            OBJECT-TYPE
        SYNTAX                  SnmpAdminString
        MAX-ACCESS              accessible-for-notify
        STATUS                  current
        DESCRIPTION
    "Textual information about the notification event and the
     iSNS Server generating the notification.  An example is:
     iSNS Server Started."
        ::= { isnsNotificationsInfo 1 }

    isnsAddressNotificationType OBJECT-TYPE
        SYNTAX                  InetAddressType
        MAX-ACCESS              accessible-for-notify
        STATUS                  current
        DESCRIPTION
    "The type of Inet address in isnsAddressNotification.  If
     the address is specified, then it must be a valid unicast
     address and the value of this object must be ipv4(1),
     ipv6(2), ipv4z(3), or ipv6z(4); otherwise, the value
     of this object is unknown(0), and the value of
     isnsAddressNotification is the zero-length string."
        ::= { isnsNotificationsInfo 2 }

    isnsAddressNotification     OBJECT-TYPE
        SYNTAX                  InetAddress
        MAX-ACCESS              accessible-for-notify
        STATUS                  current
        DESCRIPTION
    "Identifies the IP address of the iSNS Server.  The format of
```

```
       this object is specified by isnsAddressNotificationType.
       The IP address will always be specified in the notification
       unless an error causes the IP address to not be known."
          ::= { isnsNotificationsInfo 3 }

      isnsTcpPortNotification     OBJECT-TYPE
          SYNTAX                 InetPortNumber
          MAX-ACCESS             accessible-for-notify
          STATUS                 current
          DESCRIPTION
      "Indicates the TCP port the iSNS Server is using,
       or 0 if TCP-based registrations are not supported."
          ::= { isnsNotificationsInfo 4 }

      isnsUdpPortNotification     OBJECT-TYPE
          SYNTAX                 InetPortNumber
          MAX-ACCESS             accessible-for-notify
          STATUS                 current
          DESCRIPTION
      "Indicates the UDP port the iSNS Server is using,
       or 0 if UDP-based registrations are not supported."
          ::= { isnsNotificationsInfo 5 }

      --
      -- iSNS Notification Block -----------------
      --

      isnsServerStart            NOTIFICATION-TYPE
          OBJECTS {
              isnsInstanceInfo,
              isnsAddressNotificationType,
              isnsAddressNotification,
              isnsTcpPortNotification,
              isnsUdpPortNotification
                  }
          STATUS                 current
          DESCRIPTION
      "This notification is sent when an iSNS Server begins
       operation.  The notification provides the following:
              isnsInstanceInfo : iSNS Server textual information
              isnsAddressTypeNotification : iSNS Server address type
              isnsAddressNotification : iSNS Server address
              isnsTcpPortNotification : iSNS Server TCP Port
              isnsUdpPortNotification : iSNS Server UDP Port
      "
          ::= { isnsNotifications 1 }

      isnsServerShutdown         NOTIFICATION-TYPE
```

```
        OBJECTS {
            isnsInstanceInfo,
            isnsAddressNotificationType,
            isnsAddressNotification,
            isnsTcpPortNotification,
            isnsUdpPortNotification
                }
        STATUS                  current
        DESCRIPTION
    "This notification is sent when an iSNS Server is
     shutdown.  The notification provides the following:
            isnsInstanceInfo : iSNS Server textual information
            isnsAddressTypeNotification : iSNS Server address type
            isnsAddressNotification : iSNS Server address
            isnsTcpPortNotification : iSNS Server TCP Port
            isnsUdpPortNotification : iSNS Server UDP Port
    "
        ::= { isnsNotifications 2 }

    ------------------------------------------------------------
    --
    -- Compliance Information
    --

    isnsCompliances OBJECT IDENTIFIER ::= { isnsConformance 1 }

    isnsIscsiServerCompliance MODULE-COMPLIANCE
        STATUS                  current
        DESCRIPTION
    "Initial compliance statement for an iSNS Server
     providing support to iSCSI clients."
        MODULE       -- this module
        MANDATORY-GROUPS {
            isnsServerAttributesGroup,
            isnsServerIscsiControlNodeGroup,
            isnsServerIscsiDdsDdObjGroup,
            isnsServerRegIscsiObjGroup,
            isnsServerNumObjectsGroup,
            isnsNotificationsObjGroup,
            isnsServerNotificationGroup
                        }
        OBJECT isnsServerDiscoveryMcGroupType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
    "Only support for unknown, ipv4, ipv6, ipv4z, ipv6z
     is required."
```

```
        OBJECT isnsServerDiscoveryMcGroupAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z
       and their related SIZE need to be supported."

        OBJECT isnsDdPortalMemberAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, ipv6z
       is required."

        OBJECT isnsDdPortalMemberAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z
       and their related SIZE need to be supported."

        OBJECT isnsRegEntityManagementAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, ipv6z
       is required."

        OBJECT isnsRegEntityManagementAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z
       and their related SIZE need to be supported."

        OBJECT isnsRegPortalAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, ipv6z
       is required."

        OBJECT isnsRegPortalAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z
       and their related SIZE need to be supported."

        OBJECT isnsRegPgPortalAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
```

```
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, ipv6z
       is required."

        OBJECT isnsRegPgPortalAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z
       and their related SIZE need to be supported."

        OBJECT isnsAddressNotificationType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, ipv6z
       is required."

        OBJECT isnsAddressNotification
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z
       and their related SIZE need to be supported."
        ::= { isnsCompliances 1 }

      isnsIfcpServerCompliance MODULE-COMPLIANCE
        STATUS                  current
        DESCRIPTION
      "Initial compliance statement for an iSNS Server
       providing support to iFCP Clients."
        MODULE       -- this module
        MANDATORY-GROUPS {
            isnsServerAttributesGroup,
            isnsServerIfcpPortControlNodeGroup,
            isnsServerIfcpDdsDdObjGroup,
            isnsServerRegIfcpObjGroup,
            isnsServerNumObjectsGroup,
            isnsNotificationsObjGroup,
            isnsServerNotificationGroup
                        }
        OBJECT isnsServerDiscoveryMcGroupType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
       is required."

        OBJECT isnsServerDiscoveryMcGroupAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
```

```
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."

        OBJECT isnsDdPortalMemberAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
       is required."

        OBJECT isnsDdPortalMemberAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."

        OBJECT isnsRegEntityManagementAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
       is required."

        OBJECT isnsRegEntityManagementAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."

        OBJECT isnsRegPortalAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
       is required."

        OBJECT isnsRegPortalAddress
        SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
        DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."

        OBJECT isnsRegFcNodeAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
```

```
       is required."

          OBJECT isnsRegFcNodeAddress
          SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
          DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."

          OBJECT isnsRegFcPortAddressType
          SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                   ipv4z(3), ipv6z(4) }
          DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
       is required."

          OBJECT isnsRegFcPortAddress
          SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
          DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."

          OBJECT isnsAddressNotificationType
          SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                   ipv4z(3), ipv6z(4) }
          DESCRIPTION
      "Only support for unknown, ipv4, ipv6, ipv4z, and ipv6z
       is required."

          OBJECT isnsAddressNotification
          SYNTAX InetAddress (SIZE (0 | 4 | 8 | 16 | 20 ))
          DESCRIPTION
      "Only addresses for unknown, ipv4, ipv6, ipv4z, ipv6z,
       and their related SIZE need to be supported."
          ::= { isnsCompliances 2 }

   isnsGroups OBJECT IDENTIFIER ::= { isnsConformance 2 }

      isnsServerAttributesGroup      OBJECT-GROUP
          OBJECTS {
             isnsServerName,
             isnsServerIsnsVersion,
             isnsServerVendorInfo,
             isnsServerPhysicalIndex,
             isnsServerTcpPort,
             isnsServerUdpPort,
             isnsServerDiscontinuityTime,
             isnsServerRole,
             isnsServerDiscoveryMethodsEnabled,
```

```
            isnsServerDiscoveryMcGroupType,
            isnsServerDiscoveryMcGroupAddress,
            isnsServerEsiNonResponseThreshold,
            isnsServerEnableControlNodeMgtScn,
            isnsServerDefaultDdDdsStatus,
            isnsServerUpdateDdDdsSupported,
            isnsServerUpdateDdDdsEnabled
                 }
        STATUS                  current
        DESCRIPTION
    "iSNS Server attributes."
           ::= { isnsGroups 1 }

    isnsServerNumObjectsGroup      OBJECT-GROUP
        OBJECTS {
            isnsNumDds,
            isnsNumDd,
            isnsNumEntities,
            isnsNumPortals,
            isnsNumPortalGroups,
            isnsNumIscsiNodes,
            isnsNumFcPorts,
            isnsNumFcNodes,
            isnsRegEntityInfoNumPortals,
            isnsRegEntityInfoNumPortalGroups,
            isnsRegEntityInfoNumIscsiNodes,
            isnsRegEntityInfoNumFcPorts,
            isnsRegEntityInfoNumFcNodes
                 }
        STATUS                  current
        DESCRIPTION
    "Managed objects indicating the number of registered objects
     in an iSNS Server or the number of registered objects
     associated with a registered Entity.  These managed objects
     are optional to implement."
           ::= { isnsGroups 2 }

    isnsServerIscsiControlNodeGroup    OBJECT-GROUP
        OBJECTS {
            isnsControlNodeIscsiNodeName,
            isnsControlNodeIscsiIsRegistered,
            isnsControlNodeIscsiRcvMgtSCN
                 }
        STATUS                  current
        DESCRIPTION
    "iSNS Server iSCSI control node managed objects."
           ::= { isnsGroups 3 }
```

```
    isnsServerIfcpPortControlNodeGroup   OBJECT-GROUP
        OBJECTS {
           isnsControlNodeFcPortIsRegistered,
           isnsControlNodeFcPortRcvMgtSCN
                }
        STATUS                  current
        DESCRIPTION
    "iSNS Server iFCP Port control node managed objects."
           ::= { isnsGroups 4 }

    isnsServerIscsiDdsDdObjGroup   OBJECT-GROUP
        OBJECTS {
           isnsDdsSymbolicName,
           isnsDdsStatus,
           isnsDdsMemberSymbolicName,
           isnsDdSymbolicName,
           isnsDdFeatures,
           isnsDdIscsiMemberName,
           isnsDdIscsiMemberIsRegistered,
           isnsDdPortalMemberAddressType,
           isnsDdPortalMemberAddress,
           isnsDdPortalMemberPortType,
           isnsDdPortalMemberPort,
           isnsDdPortalMemberIsRegistered
                }
        STATUS                  current
        DESCRIPTION
    "iSNS Server DDS and DD managed objects for iSCSI."
           ::= { isnsGroups 5 }

    isnsServerIfcpDdsDdObjGroup    OBJECT-GROUP
        OBJECTS {
           isnsDdsSymbolicName,
           isnsDdsStatus,
           isnsDdSymbolicName,
           isnsDdFeatures,
           isnsDdPortalMemberAddressType,
           isnsDdPortalMemberAddress,
           isnsDdPortalMemberPortType,
           isnsDdPortalMemberPort,
           isnsDdPortalMemberIsRegistered,
           isnsDdFcPortMemberIsRegistered
                }
        STATUS                  current
        DESCRIPTION
    "iSNS Server DDS and DD managed objects for iFCP."
           ::= { isnsGroups 6 }
```

```
      isnsServerRegIscsiObjGroup   OBJECT-GROUP
          OBJECTS {
             isnsRegEntityEID,
             isnsRegEntityProtocol,
             isnsRegEntityManagementAddressType,
             isnsRegEntityManagementAddress,
             isnsRegEntityTimestamp,
             isnsRegEntityVersionMin,
             isnsRegEntityVersionMax,
             isnsRegEntityRegistrationPeriod,
             isnsRegEntityInfoNumPortals,
             isnsRegEntityInfoNumPortalGroups,
             isnsRegEntityInfoNumIscsiNodes,
             isnsRegEntityInfoNumFcPorts,
             isnsRegEntityInfoNumFcNodes,
             isnsRegPortalAddressType,
             isnsRegPortalAddress,
             isnsRegPortalPortType,
             isnsRegPortalPort,
             isnsRegPortalSymbolicName,
             isnsRegPortalEsiInterval,
             isnsRegPortalEsiPortType,
             isnsRegPortalEsiPort,
             isnsRegPortalScnPortType,
             isnsRegPortalScnPort,
             isnsRegPortalSecurityInfo,
             isnsRegPgIscsiNodeIndex,
             isnsRegPgIscsiName,
             isnsRegPgPortalPortalIndex,
             isnsRegPgPortalAddressType,
             isnsRegPgPortalAddress,
             isnsRegPgPortalPortType,
             isnsRegPgPortalPort,
             isnsRegPgPGT,
             isnsRegIscsiNodeName,
             isnsRegIscsiNodeType,
             isnsRegIscsiNodeAlias,
             isnsRegIscsiNodeScnTypes,
             isnsRegIscsiNodeWwnToken,
             isnsRegIscsiNodeAuthMethod
                  }
          STATUS                  current
          DESCRIPTION
      "iSNS Server registered iSCSI managed objects."
             ::= { isnsGroups 7 }

      isnsServerRegIfcpObjGroup    OBJECT-GROUP
          OBJECTS {
```

```
            isnsRegEntityEID,
            isnsRegEntityProtocol,
            isnsRegEntityManagementAddressType,
            isnsRegEntityManagementAddress,
            isnsRegEntityTimestamp,
            isnsRegEntityVersionMin,
            isnsRegEntityVersionMax,
            isnsRegEntityRegistrationPeriod,
            isnsRegEntityInfoNumPortals,
            isnsRegEntityInfoNumPortalGroups,
            isnsRegEntityInfoNumIscsiNodes,
            isnsRegEntityInfoNumFcPorts,
            isnsRegEntityInfoNumFcNodes,
            isnsRegPortalAddressType,
            isnsRegPortalAddress,
            isnsRegPortalPortType,
            isnsRegPortalPort,
            isnsRegPortalSymbolicName,
            isnsRegPortalEsiInterval,
            isnsRegPortalEsiPortType,
            isnsRegPortalEsiPort,
            isnsRegPortalScnPortType,
            isnsRegPortalScnPort,
            isnsRegPortalSecurityInfo,
            isnsRegFcPortID,
            isnsRegFcPortType,
            isnsRegFcPortSymbolicName,
            isnsRegFcPortFabricPortWwn,
            isnsRegFcPortHA,
            isnsRegFcPortAddressType,
            isnsRegFcPortAddress,
            isnsRegFcPortFcCos,
            isnsRegFcPortFc4Types,
            isnsRegFcPortFc4Descr,
            isnsRegFcPortFc4Features,
            isnsRegFcPortScnTypes,
            isnsRegFcPortRole,
            isnsRegFcPortFcNodeWwnn,
            isnsRegFcPortPpnWwn,
            isnsRegFcNodeSymbolicName,
            isnsRegFcNodeAddressType,
            isnsRegFcNodeAddress,
            isnsRegFcNodeIPA,
            isnsRegFcNodeProxyIscsiName,
            isnsRegFcNodeNumFcPorts,
            isnsRegFcNodePortEntityIndex
                }
        STATUS                  current
```

```
        DESCRIPTION
      "iSNS Server registered iFCP managed objects."
             ::= { isnsGroups 8 }

      isnsNotificationsObjGroup    OBJECT-GROUP
          OBJECTS {
             isnsInstanceInfo,
             isnsAddressNotificationType,
             isnsAddressNotification,
             isnsTcpPortNotification,
             isnsUdpPortNotification
                  }
          STATUS                  current
          DESCRIPTION
      "iSNS Notification managed objects."
             ::= { isnsGroups 9 }

      isnsServerNotificationGroup  NOTIFICATION-GROUP
          NOTIFICATIONS {
             isnsServerStart,
             isnsServerShutdown
                       }
          STATUS                  current
          DESCRIPTION
      "iSNS Server Notification managed objects."
             ::= { isnsGroups 10 }
   END
```

6. IANA Considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

Descriptor	OBJECT IDENTIFIER value
isnsMIB	{ mib-2 163 }

This RFC utilizes the IANA registry of iSNS parameters. This registry was created for the iSNS Specification [RFC4171], and is located at http://www.iana.org/assignments/isns-parameters. Specifically, the isnsRegEntityProtocol values used in the MIB module are the values for the Block Storage Protocols that IANA assigns and documents in http://www.iana.org/assignments/isns-parameters.

7. Security Considerations

There are no management objects defined in this MIB module that have a MAX-ACCESS clause of read-write and/or read-create. So, if this MIB module is implemented correctly, then there is no risk that an intruder can alter or create any management objects of this MIB module via direct SNMP SET 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:

The isnsDdsMemberTable contains information about which Discovery Domains may be enabled at the same time.

The isnsDdTable contains information about Discovery Domains, containing storage nodes with an ability to communicate and exchange storage data.

The isnsDdIscsiMemberTable indicates which iSCSI nodes are contained in which Discovery Domains.

The isnsDdPortalMemberTable indicates which iSCSI portals are contained in which Discovery Domains.

The isnsDdFcPortMemberTable indicates which iFCP FC N_Ports are contained in which Discovery Domains.

The isnsControlNodeIscsiTable indicates which iSCSI nodes have the ability to possibly control an iSNS server.

The isnsControlNodeFcPortTable indicates which iFCP FC N_Ports have the ability to possibly control an iSNS server.

The above object tables provide information about storage objects sessions, and can indicate to a user who is communicating and exchanging storage data.

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

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

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

8. Normative References

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

[RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case J., Rose, M., and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

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

[RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

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

[RFC3720] Satran, J., Meth, K., Sapuntzakis, C., Chadalapaka, M., and E. Zeidner, "Internet Small Computer Systems Interface (iSCSI)", RFC 3720, March 2004.

[RFC4001] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", RFC 4001, February 2005.

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

[RFC4133] McCloghrie, K. and A. Bierman, "Entity MIB (Version 3)", RFC 4133, August 2005.

[RFC4171] Tseng, J., Gibbons, K., Travostino, F., Du Laney, C., and J. Souza, "Internet Storage Name Service (iSNS)", RFC 4171, September 2005.

[RFC4172] Monia, C., Mullendore, R., Travostino, F., Jeong, W., and M. Edwards, "iFCP - A Protocol for Internet Fibre Channel Storage Networking", RFC 4172, September 2005.

9. Informative References

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

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