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

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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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.
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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.

```
+--------------+    +--------------+
| MANAGED iSNS |1  *| CONTROL NODE |
|    SERVER    |----|    INFO      |
|     INFO     |    +--------------+
+--------------+
```

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
   InetSocketAddress,
   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"

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DESCRIPTION

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

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REVISION "200707110000Z"

DESCRIPTION

"Initial version of iSNS Management Module. This MIB published as RFC 4939."

::= { mib-2 163 }
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:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>DDS Enabled</td>
</tr>
<tr>
<td>All others</td>
<td>RESERVED</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Boot List</td>
</tr>
<tr>
<td>All others</td>
<td>RESERVED</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Flag Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Control Nodes are allowed</td>
</tr>
</tbody>
</table>
Target iSCSI Nodes are allowed
Initiator iSCSI Nodes are allowed
Target iFCP Ports are allowed
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.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Flag Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1 = Tunnel Mode Preferred; 0 = No Preference</td>
</tr>
<tr>
<td>26</td>
<td>1 = Transport Mode Preferred; 0 = No Preference</td>
</tr>
<tr>
<td>27</td>
<td>1 = PFS Enabled; 0 = PFS Disabled</td>
</tr>
<tr>
<td>28</td>
<td>1 = Aggressive Mode Enabled; 0 = Disabled</td>
</tr>
<tr>
<td>29</td>
<td>1 = Main Mode Enabled; 0 = MM Disabled</td>
</tr>
<tr>
<td>30</td>
<td>1 = IKE/IPsec Enabled; 0 = IKE/IPsec Disabled</td>
</tr>
<tr>
<td>31</td>
<td>1 = Bitmap VALID; 0 = INVALID</td>
</tr>
</tbody>
</table>
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),
    aggressiveModeEnabled(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
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),
IsnsIscsiScnType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION
"The iSCSI Node State Change Notification (SCN) values for a node as defined in RFC 4171.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Initiator and self information only</td>
</tr>
<tr>
<td>25</td>
<td>Target and self information only</td>
</tr>
<tr>
<td>26</td>
<td>Management registration/SCN</td>
</tr>
<tr>
<td>27</td>
<td>Object removed</td>
</tr>
<tr>
<td>28</td>
<td>Object added</td>
</tr>
<tr>
<td>29</td>
<td>Object updated</td>
</tr>
<tr>
<td>30</td>
<td>DD or DDS member removed (Mgmt Reg/SCN only)</td>
</tr>
<tr>
<td>31</td>
<td>DD or DDS member added (Mgmt Reg/SCN only)</td>
</tr>
<tr>
<td>All others</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

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),
  reserved24(24), reserved25(25), reserved26(26),
  reserved27(27),
  class3(28),
  class2(29),
  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.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Initiator and self information only</td>
</tr>
<tr>
<td>25</td>
<td>Target and self information only</td>
</tr>
<tr>
<td>26</td>
<td>Management registration/SCN</td>
</tr>
<tr>
<td>27</td>
<td>Object removed</td>
</tr>
<tr>
<td>28</td>
<td>Object added</td>
</tr>
<tr>
<td>29</td>
<td>Object updated</td>
</tr>
<tr>
<td>30</td>
<td>DD or DDS member removed (Mgmt Reg/SCN only)</td>
</tr>
<tr>
<td>31 (Lsb)</td>
<td>DD or DDS member added (Mgmt Reg/SCN only)</td>
</tr>
<tr>
<td>All others</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Port Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Control</td>
</tr>
<tr>
<td>30</td>
<td>FCP Initiator</td>
</tr>
<tr>
<td>31</td>
<td>FCP Target</td>
</tr>
<tr>
<td>All others</td>
<td>RESERVED</td>
</tr>
</tbody>
</table>

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),
```


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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.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>notSet</td>
<td>The iSNS Server role is not configured.</td>
</tr>
<tr>
<td>server</td>
<td>The iSNS Server instance is an operational iSNS Server.</td>
</tr>
<tr>
<td>backupServer</td>
<td>The iSNS Server instance is</td>
</tr>
</tbody>
</table>
isnsServerDiscoveryMethodsEnabled  OBJECT-TYPE
SYNTAX                  IsnsSrvrDiscoveryMethodsType
MAX-ACCESS              read-only
STATUS                  current

"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 9 } isnsServerDiscoveryMcGroupType   OBJECT-TYPE
SYNTAX                  InetAddressType
MAX-ACCESS              read-only
STATUS                  current

"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 10 } isnsServerDiscoveryMcGroupAddress  OBJECT-TYPE
SYNTAX                  InetAddress
MAX-ACCESS              read-only
STATUS                  current

"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 11 } isnsServerEsiNonResponseThreshold OBJECT-TYPE
SYNTAX                  Unsigned32 ( 0 .. 65535 )
MAX-ACCESS              read-only
STATUS                  current

"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
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 -----------------------------
--

isnsDdT able 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 }

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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."
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 1 }

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 2 }

--
-- 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, 
             isnsDdDd, 
             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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Entity Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Protocol</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>iSCSI</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>iFCP</td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td>As assigned by IANA</td>
<td></td>
</tr>
</tbody>
</table>

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 IsnsPortalPortTypeIds,
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,
   isnsRegPgPortalPortalAddressType InetAddressType,
   isnsRegPgPortalPortalAddress InetAddress,
   isnsRegPgPortalPortType IsnsPortalPortTypeId,
   isnsRegPgPortalPort InetPortNumber,
   isnsRegPgPGT IsnsPortalGroupTagIdOrNull
}
isnsRegPgIndex  OBJECT-TYPE
SYNTAX          IsnsPortalGroupId
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 }

--
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 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,
  isnsRegFcNodeIPAF 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 iNS 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 }

--
-- iNS 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 iNS. 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 iNS."
REFERENCE "RFC 4172, Section 4"
INDEX { isnsServerIndex,
          isnsRegEntityIndex,
          isnsRegFcPortWwpn }
::= { isnsRegFcPortTable 1 }

IsnsRegFcPortEntry ::= SEQUENCE {
  isnsRegFcPortWwpn FcNameIdOrZero,
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'
f1Port       (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 }
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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
}

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) }
Objects

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."

isnsDdPortalMemberAddressType

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

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

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."

isnsRegEntityManagementAddressType

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

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

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."

isnsRegPortalAddressType

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

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

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."

isnsRegPgPortalAddressType

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

DESCRIPTION
"Only support for unknown, ipv4, ipv6, ipv4z, ipv6z is required."
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 ))
"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,
    isnsDfPortMemberIsRegistered
  }
  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,
isnsRegEntityInfoNumFcNodes,
isnsRegPortalAddressType,
isnsRegPortalAddress,
isnsRegPortalPortType,
isnsRegPortalPort,
isnsRegPortalSymbolicName,
isnsRegPortalEsiInterval,
isnsRegPortalEsiPortType,
isnsRegPortalEsiPort,
isnsRegPortalScnPortType,
isnsRegPortalScnPort,
isnsRegPortalScnPort,
isnsRegPortalSecurityInfo,
isnsRegFcPortID,
isnsRegFcPortType,
isnsRegFcPortSymbolicName,
isnsRegFcPortFabricPortWwn,
isnsRegFcPortHA,
isnsRegFcPortAddressType,
isnsRegFcPortAddress,
isnsRegFcPortFcCos,
isnsRegFcPortFc4Types,
isnsRegFcPortFc4Descr,
isnsRegFcPortFc4Features,
isnsRegFcPortScnTypes,
isnsRegFcPortRole,
isnsRegFcPortFcNodeWwnn,
isnsRegFcPortPpnWwn,
isnsRegFcNodeSymbolicName,
isnsRegFcNodeAddressType,
isnsRegFcNodeAddress,
isnsRegFcNodeIPPA,
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:

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>OBJECT IDENTIFIER value</th>
</tr>
</thead>
<tbody>
<tr>
<td>isnsMIB</td>
<td>{ mib-2 163 }</td>
</tr>
</tbody>
</table>

This RFC utilizes the IANA registry of iSNS parameters. This
registry was created for the iSNS Specification [RFC4171], and is
Specifically, the isnsRegEntityProtocol values used in the MIB module
are the values for the Block Storage Protocols that IANA assigns and
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 isnsDdsMemTable 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 isnsDdIscsiMemTable indicates which iSCSI nodes are contained in which Discovery Domains.

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

The isnsDdFCPortMemTable 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


9. Informative References


10. Acknowledgements

This memo is a product of the IP Storage (IPS) working group within the Internet Engineering Task Force.

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Acknowledgement

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