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**Definitions of Managed Objects
for the Internet Small Computer System Interface (iSCSI)**

Abstract

This document defines a portion of the Management Information Base (MIB) for use with network management protocols. In particular, it defines objects for managing a client using the Internet Small Computer System Interface (iSCSI) protocol (SCSI over TCP).

This document obsoletes RFC 4544.

Status of This Memo

This is an Internet Standards Track document.

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Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <http://www.rfc-editor.org/info/rfc7147>.

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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

This document defines a MIB module for iSCSI [RFC7143], used to manage devices that implement the iSCSI protocol. It obsoletes RFC 4544 [RFC4544].

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

3. Relationship to Other MIB Modules

The iSCSI MIB module is normally layered between the SCSI MIB module [RFC4455] and the TCP MIB module [RFC4022], and it makes use of the IP Storage (IPS) Identity Authentication MIB module [RFC4545]. Here is how these modules are related:

SCSI MIB Within systems where a SCSI layer is present, each `iscsiNode`, whether it has an initiator role, target role, or both, is related to one SCSI device within the SCSI MIB module. In this case, the `iscsiNodeTransportType` attribute points to the SCSI transport object within the SCSI MIB module, which in turn contains an attribute that points back to the `iscsiNode`. In this way, a management station can navigate between the two MIB modules. In systems where a SCSI layer is not present, such as within an iSCSI proxy device, the `iscsiNodeTransportType` attribute points to the appropriate corresponding object within the appropriate MIB or is left blank.

- TCP MIB** Each iSCSI connection is related to one transport-level connection. Currently, iSCSI uses only TCP; the iSCSI connection is related to a TCP connection using its normal (protocol, source address, source port, destination address, destination port) 5-tuple.
- AUTH MIB** Each iSCSI node that serves a target role can have a list of authorized initiators. Each of the entries in this list points to an identity within the IPS Identity Authentication MIB module that will be allowed to access the target. iSCSI nodes that serve in an initiator role can also have a list of authorized targets. Each of the entries in this list points to an identity within the IPS-AUTH MIB module to which the initiator should attempt to establish sessions. The IPS-AUTH MIB module includes information used to identify initiators and targets by their iSCSI name, IP address, and/or credentials.

This MIB module imports objects from RFCs 2578 [RFC2578], 2579 [RFC2579], 2580 [RFC2580], and 3411 [RFC3411]. It also imports textual conventions from the INET-ADDRESS-MIB [RFC4001].

4. Relationship to SNMP Contexts

Each non-scalar object in the iSCSI MIB module is indexed first by an iSCSI instance. Each instance is a collection of nodes, portals, sessions, etc., that can define a physical or virtual partitioning of an iSCSI-capable device. The use of an instance works well with partitionable or hierarchical storage devices and fits in logically with other management schemes. Instances do not replace SNMP contexts; however, they do provide a very simple way to assign a virtual or physical partition of a device to one or more SNMP contexts, without having to do so for each individual node, portal, and session row.

5. Differences from RFC 4544

[RFC7143] updates several RFCs, including [RFC3720]. This document updates the iSCSI MIB correspondingly. The document uses `iSCSIProtocolLevel` as defined in [RFC7144]. It obsoletes [RFC4544]. Below is a brief description of the changes.

- Added `iscsiInstXNodeArchitecture` to `InstanceAttributes`.
- Added `iscsiSsnTaskReporting` of type BITS to `SessionAttributes`.
- Added `iscsiSsnProtocolLevel` to `SessionAttributes`.
- Deprecated the marker objects.
- Fixed the errata to [RFC4544].

- Added NOP counters at iSCSI session scope for heartbeat tracking.
- Added port number to the `iscsiTgtLoginFailure` and `iscsiIntrLoginFailure` notifications, and to the last failure info in `iscsiInitiatorAttributesEntry`.
- Added description string to the iSCSI portal.
- Added `iscsiInstSsnTgtUnmappedErrors` to support "Target Unmapped" session failure reporting in the `iscsiInstSessionFailure` notification.
- Added `iscsiTgtLogoutCxnClosed` and `iscsiTgtLogoutCxnRemoved`, which maintain the count of Logout Command PDUs received by the target with reason codes 1 and 2, respectively.
- Changed the conformance statements to match the above.

6. Discussion

This MIB module structure supplies configuration, fault, and statistics information for iSCSI devices [RFC7143]. It is structured around the well-known iSCSI objects, such as targets, initiators, sessions, connections, and the like.

This MIB module may also be used to configure access to iSCSI targets, by creating iSCSI portals and authorization list entries.

It is worthwhile to note that this is an iSCSI MIB module and as such reflects only iSCSI objects. This module does not contain information about the SCSI-layer attributes of a device. If a SCSI layer is present, the SCSI MIB module [RFC4455] may be used to manage SCSI information for a device.

The iSCSI MIB module consists of several "objects", each of which is represented by one or more tables. This section contains a brief description of the object hierarchy and a description of each object, followed by a discussion of the actual table structure within the objects.

6.1. iSCSI MIB Object Model

The top-level object in this structure is the iSCSI instance, which "contains" all of the other objects.

```
iscsiInstance
-- A distinct iSCSI entity within the managed system.
iscsiPortal
-- An IP address used by this instance.
iscsiTargetPortal
-- Contains portal information relevant when the portal
-- is used to listen for connections to its targets.
iscsiInitiatorPortal
-- Contains portal information relevant when the portal
-- is used to initiate connections to other targets.
iscsiNode
-- An iSCSI node can act as an initiator, a target, or both.
-- Contains generic (non-role-specific) information.
iscsiTarget
-- Target-specific iSCSI node information.
iscsiTgtAuth
-- A list of initiator identities that are allowed
-- access to this target.
iscsiInitiator
-- Initiator-specific iSCSI node information.
iscsiIntrAuth
-- A list of target identities to which this initiator
-- is configured to establish sessions.
iscsiSession
-- An active iSCSI session between an initiator and
-- target. The session's direction may be Inbound
-- (an outside initiator to the target represented by
-- this node) or Outbound (the initiator represented by
-- this node to an outside target).
iscsiConnection
-- An active TCP connection within an iSCSI session.
```

An iSCSI node can be an initiator, a target, or both. The iSCSI node's portals may be used to initiate connections (initiator) or listen for connections (target), depending on whether the iSCSI node is acting as an initiator or target. The iSCSI MIB module assumes that any target may be accessed via any portal that can take on a target role, although other access controls not reflected in the module might limit this.

6.2. iSCSI MIB Table Structure

Each iSCSI object exports one or more tables: an attributes table, and zero or more statistics tables, which augment the attributes table. Since iSCSI is an evolving standard, it is much cleaner to provide statistics and attributes as separate tables, allowing attributes and statistics to be added independently. In a few cases, there are multiple categories of statistics that will likely grow; in this case, an object will contain multiple statistics tables.

```
iscsiObjects
  iscsiDescriptors
  iscsiInstance
    iscsiInstanceAttributesTable
    iscsiInstanceSsnErrorStatsTable
    -- Counts abnormal session terminations
  iscsiPortal
    iscsiPortalAttributesTable
  iscsiTargetPortal
    iscsiTgtPortalAttributesTable
  iscsiInitiatorPortal
    iscsiIntrPortalAttributesTable
  iscsiNode
    iscsiNodeAttributesTable
  iscsiTarget
    iscsiTargetAttributesTable
    iscsiTargetLoginStatsTable
    -- Counts successful and unsuccessful logins
    iscsiTargetLogoutStatsTable
    -- Counts normal and abnormal logouts
  iscsiTgtAuthorization
    iscsiTgtAuthAttributesTable
  iscsiInitiator
    iscsiInitiatorAttributesTable
    iscsiInitiatorLoginStatsTable
    -- Counts successful and unsuccessful logins
    iscsiInitiatorLogoutStatsTable
    -- Counts normal and abnormal logouts
  iscsiIntrAuthorization
    iscsiIntrAuthAttributesTable
  iscsiSession
    iscsiSessionAttributesTable
    iscsiSessionStatsTable
    -- Performance-related counts (requests, responses, bytes)
    iscsiSessionCxnErrorStatsTable
    -- Counts digest errors, connection errors, etc.
  iscsiConnection
    iscsiConnectionAttributesTable
```


Note that this module does not attempt to count everything that could be counted; it is designed to include only those counters that would be useful for identifying performance, security, and fault problems from a management station.

6.3. iscsiInstance

The `iscsiInstanceAttributesTable` is the primary table of the iSCSI MIB module. Every table entry in this module is "owned" by exactly one iSCSI instance; all other table entries in the module include this table's index as their primary index.

Most implementations will include just one iSCSI instance row in this table. However, this table exists to allow for multiple virtual instances. For example, many IP routing products now allow multiple virtual routers. The iSCSI MIB module has the same premise; a large system could be "partitioned" into multiple, distinct virtual systems.

This also allows a single SNMP agent to proxy for multiple subsystems, perhaps a set of stackable devices, each of which has one or even more instances.

The instance attributes include the iSCSI vendor and version, as well as information on the last target or initiator at the other end of a session that caused a session failure.

The `iscsiInstanceSsnErrorStatsTable` augments the attributes table and provides statistics on session failures due to digest, connection, or iSCSI format errors.

6.4. iscsiPortal

The `iscsiPortalAttributesTable` lists iSCSI portals that can be used to listen for connections to targets, to initiate connections to other targets, or to do both.

Each row in the table includes an IP address (either v4 or v6), and a transport protocol (currently only TCP is defined). Each portal may have additional attributes, depending on whether it is an initiator portal, a target portal, or both. Initiator portals also have portal tags; these are placed in corresponding rows in the `iscsiIntrPortalAttributesTable`. Target portals have both portal tags and ports (e.g., TCP listen ports if the transport protocol is TCP); these are placed in rows in the `iscsiTgtPortalAttributesTable`.

Portal rows, along with their initiator and target portal counterparts, may be created and destroyed through this MIB module by a management station. Rows in the initiator and target portal tables are created and destroyed automatically by the agent when a row is created or destroyed in the `iscsiPortalAttributesTable` or when the value of `iscsiPortalRoles` changes. Attributes in these tables may then be modified by the management station if the agent implementation allows.

When created by a management station, the `iscsiPortalRoles` attribute is used to control row creation in the initiator and target portal tables. Creating a row with the `targetTypePortal` bit set in `iscsiPortalRoles` will cause the implementation to start listening for iSCSI connections on the portal. Creating a row with the `initiatorTypePortal` bit set in `iscsiPortalRoles` will not necessarily cause connections to be established; it is left to the implementation whether and when to make use of the portal. Both bits may be set if the portal is to be used by both initiator and target nodes.

When deleting a row in the `iscsiPortalAttributesTable`, all connections associated with that row are terminated. The implementation may either terminate the connection immediately or request a clean shutdown as specified in [RFC7143]. An outbound connection (when an `iscsiInitiatorPortal` is deleted) matches the portal if its `iscsiCxnLocalAddr` matches the `iscsiPortalAddr`. An inbound connection (when an `iscsiTargetPortal` is deleted) matches the portal if its `iscsiCxnLocalAddr` matches the `iscsiPortalAddr` and if its `iscsiCxnLocalPort` matches the `iscsiTargetPortalPort`.

Individual objects within a row in this table may not be modified while the row is active. For instance, changing the IP address of a portal requires that the rows associated with the old IP address be deleted and that new rows be created (in either order).

6.5. `iscsiTargetPortal`

The `iscsiTgtPortalAttributesTable` contains target-specific attributes for iSCSI portals. Rows in this table use the same indices as their corresponding rows in the `iscsiPortalAttributesTable`, with the addition of `iscsiNodeIndex`.

Rows in this table are created when the `targetTypePortal` bit is set in the `iscsiPortalRoles` attribute of the corresponding `iscsiPortalAttributesEntry`; they are destroyed when this bit is cleared.

This table contains the TCP (or other protocol) port on which the socket is listening for incoming connections. It also includes a portal group aggregation tag; iSCSI target portals that are within this instance and share the same tag can contain connections within the same session.

This table will be empty for iSCSI instances that contain only initiators (such as iSCSI host driver implementations).

Many implementations use the same Target Portal Group Tag and protocol port for all nodes accessed via a portal. These implementations will create a single row in the `iscsiTgtPortalAttributeTable`, with an `iscsiNodeIndex` of zero.

Other implementations do not use the same tag and/or port for all nodes; these implementations will create a row in this table for each (portal, node) tuple, using `iscsiNodeIndex` to designate the node for this portal tag and port.

6.6. `iscsiInitiatorPortal`

The `iscsiIntrPortalAttributesTable` contains initiator-specific objects for iSCSI portals. Rows in this table use the same indices as their corresponding entries in the `iscsiPortalAttributesTable`. A row in this table is created when the `initiatorTypePortal` bit is set in the `iscsiPortalRoles` attribute; it is destroyed when this bit is cleared.

Each row in this table contains a portal group aggregation tag, indicating which portals an initiator may use together within a multiple-connection session.

This table will be empty for iSCSI instances that contain only targets (such as most iSCSI devices).

Many implementations use the same initiator tag for all nodes accessing targets via a given portal. These implementations will create a single row in `iscsiIntrPortalAttributeTable`, with an `iscsiNodeIndex` of zero.

Other implementations do not use the same tag and/or port for all nodes; these implementations will create a row in this table for each (portal, node) tuple, using `iscsiNodeIndex` to designate the node for this portal tag and port.

6.7. iscsiNode

The `iscsiNodeAttributesTable` contains a list of iSCSI nodes, each of which may have an initiator role, a target role, or both.

This table contains the node's attributes that are common to both roles, such as its iSCSI name and alias string. Attributes specific to initiators or targets are available in the `iscsiTarget` and `iscsiInitiator` objects. Each row in this table that can fulfill a target role has a corresponding row in the `iscsiTarget` table; each entry that fulfills an initiator role has a row in the `iscsiInitiator` table. Nodes such as copy managers that can take on both roles have a corresponding row in each table.

This table also contains the login negotiations preferences for this node. These objects indicate the values this node will offer or prefer in the operational negotiation phase of the login process.

For most implementations, each entry in the table also contains a `RowPointer` to the transport table entry in the SCSI MIB module that this iSCSI node represents. For implementations without a standard SCSI layer above iSCSI, such as an iSCSI proxy or gateway, this `RowPointer` can point to a row in an implementation-specific table that this iSCSI node represents.

6.8. iscsiTarget

The `iscsiTargetAttributesTable` contains target-specific attributes for iSCSI nodes. Each entry in this table uses the same index values as its corresponding `iscsiNode` entry.

This table contains attributes used to indicate the last failure that was (or should have been) sent as a notification.

This table is augmented by the `iscsiTargetLoginStatsTable` and the `iscsiTargetLogoutStatsTable`, which count the numbers of normal and abnormal logins and logouts to this target.

6.9. iscsiTgtAuthorization

The `iscsiTgtAuthAttributesTable` contains an entry for each initiator identifier that will be allowed to access the target under which it appears. Each entry contains a `RowPointer` to a user identity in the IPS Authorization MIB module, which contains the name, address, and credential information necessary to authenticate the initiator.

6.10. iscsiInitiator

The `iscsiInitiatorAttributesTable` contains a list of initiator-specific attributes for iSCSI nodes. Each entry in this table uses the same index values as its corresponding `iscsiNode` entry.

Most implementations will include a single entry in this table, regardless of the number of physical interfaces the initiator may use.

This table is augmented by the `iscsiInitiatorLoginStatsTable` and the `iscsiInitiatorLogoutStatsTable`, which count the numbers of normal and abnormal logins and logouts from this initiator.

6.11. iscsiIntrAuthorization

The `iscsiIntrAuthAttributesTable` contains an entry for each target identifier to which the initiator is configured to establish a session.

Each entry contains a `RowPointer` to a user identity in the IPS Authorization MIB module, which contains the name, address, and credential information necessary to identify (for discovery purposes) and authenticate the target.

6.12. iscsiSession

The `iscsiSessionAttributesTable` contains a set of rows that list the sessions known to exist locally for each node in each iSCSI instance.

The session type for each session indicates whether the session is used for normal SCSI commands or for discovery using the `SendTargets` text command. Discovery sessions that do not belong to any particular node have a node index attribute of zero.

The session direction for each session indicates whether it is an Inbound session or an Outbound session. Inbound sessions are from some other initiator to the target node under which the session appears. Outbound sessions are from the initiator node under which the session appears to a target outside this iSCSI instance.

Many attributes may be negotiated when starting an iSCSI session. Most of these attributes are included in the session object.

Some attributes, such as the integrity and authentication schemes, have some standard values that can be extended by vendors to include their own schemes. These contain an object identifier, rather than the expected enumerated type, to allow these values to be extended by other MIB modules, such as an enterprise MIB module.

The `iscsiSessionStatsTable` includes statistics related to performance; it counts iSCSI data bytes and PDUs.

For implementations that support error recovery without terminating a session, the `iscsiSessionCxnErrorStatsTable` contains counters for the numbers of digest and connection errors that have occurred within the session.

6.13. `iscsiConnection`

The `iscsiConnectionAttributesTable` contains a list of active connections within each session. It contains the IP addresses and TCP (or other protocol) ports of both the local and remote sides of the connection. These may be used to locate other connection-related information and statistics in the TCP MIB module [RFC4022].

The attributes table also contains a connection state. This state is not meant to directly map to the state tables included within the iSCSI specification; they are meant to be simplified, higher-level definitions of connection state that provide information more useful to a user or network manager.

No statistics are kept for connections.

6.14. IP Addresses and TCP Port Numbers

The IP addresses in this module are represented by two attributes, one of type `InetAddressType`, and the other of type `InetAddress`. These are taken from [RFC4001], which specifies how to support addresses that may be either IPv4 or IPv6.

The TCP port numbers that appear in a few of the structures are described as simply port numbers, with a protocol attribute indicating whether they are TCP ports or something else. This will allow the module to be compatible with iSCSI over transports other than TCP in the future.

6.15. Descriptors: Using OIDs in Place of Enumerated Types

The iSCSI MIB module has a few attributes, namely, the digest method attributes, where an enumerated type would work well, except that an implementation may need to extend the attribute and add types of its own. To make this work, this MIB module defines a set of object identities within the `iscsiDescriptors` subtree. Each of these object identities is basically an enumerated type.

Attributes that make use of these object identities have a value that is an Object Identifier (OID) instead of an enumerated type. These OIDs can indicate either the object identities defined in this module or object identities defined elsewhere, such as in an enterprise MIB module. Those implementations that add their own digest methods should also define a corresponding object identity for each of these methods within their own enterprise MIB module, and return its OID whenever one of these attributes is using that method.

6.16. Notifications

Three notifications are provided. One is sent by an initiator detecting a critical login failure, another is sent by a target detecting a critical login failure, and the third is sent upon a session being terminated due to an abnormal connection or digest failure. Critical failures are defined as those that may expose security-related problems that may require immediate action, such as failures due to authentication, authorization, or negotiation problems. Attributes in the initiator, target, and instance objects provide the information necessary to send in the notification, such as the initiator or target name and IP address at the other end that may have caused the failure.

To avoid sending an excessive number of notifications due to multiple errors counted, an SNMP agent implementing the iSCSI MIB module **SHOULD NOT** send more than three iSCSI notifications in any 10-second period.

The 3-in-10 rule was chosen because one notification every three seconds was deemed often enough, but should two or three different notifications happen at the same time, it would not be desirable to suppress them. Three notifications in 10 seconds is a happy medium, where a short burst of notifications is allowed, without inundating the network and/or notification host with a large number of notifications.

7. MIB Definition

ISCSI-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY, NOTIFICATION-TYPE,
Unsigned32, Counter32, Counter64, Gauge32,
mib-2
FROM SNMPv2-SMI

TEXTUAL-CONVENTION, TruthValue, RowPointer, TimeStamp, RowStatus,
AutonomousType, StorageType
FROM SNMPv2-TC

MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF

SnmpAdminString
FROM SNMP-FRAMEWORK-MIB -- RFC 3411

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

iscsiMibModule MODULE-IDENTITY

LAST-UPDATED "201402180000Z" -- February 18, 2014

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DESCRIPTION

"This module defines management information specific
to the iSCSI protocol.

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REVISION "201402180000Z"

DESCRIPTION

"Second version of the iSCSI Protocol MIB Module.
RFC 7143 makes several updates to [RFC3720]. This
version makes corresponding updates to the MIB module.
This MIB module published as RFC 7147."

REVISION "200605220000Z"

DESCRIPTION

"Initial version of the iSCSI Protocol MIB module.
This MIB module published as RFC 4544."

::= { mib-2 142 }

iscsiNotifications OBJECT IDENTIFIER ::= { iscsiMibModule 0 }
iscsiObjects OBJECT IDENTIFIER ::= { iscsiMibModule 1 }
iscsiConformance OBJECT IDENTIFIER ::= { iscsiMibModule 2 }
iscsiAdmin OBJECT IDENTIFIER ::= { iscsiMibModule 3 }

-- Textual Conventions

IscsiTransportProtocol ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"This data type is used to define the transport
protocols that will carry iSCSI PDUs.
Protocol numbers are assigned by IANA. A
current list of all assignments is available from
<<http://www.iana.org/assignments/protocol-numbers/>>."

SYNTAX Unsigned32 (0..255)

IscsiDigestMethod ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This data type represents the methods possible
for digest negotiation.
none - a placeholder for a secondary digest method
that means only the primary method can be
used.
other - a digest method other than those defined below.
noDigest - does not support digests (will operate without
a digest (Note: implementations must support
digests to be compliant with RFC 7143).
CRC32c - require a CRC32C digest."

REFERENCE

"RFC 7143, Section 13.1, HeaderDigest and DataDigest"

SYNTAX

```
INTEGER {
    none(1),
    other(2),
    noDigest(3),
    crc32c(4)
}
```

IscsiName ::= TEXTUAL-CONVENTION

DISPLAY-HINT "223t"

STATUS current

DESCRIPTION

"This data type is used for objects whose value is an iSCSI name with the properties described in RFC 7143, Section 4.2.7.1, and encoded as specified in RFC 7143, Section 4.2.7.2. A zero-length string indicates the absence of an iSCSI name."

REFERENCE

"RFC 7143, Section 4.2.7, iSCSI Names."

SYNTAX OCTET STRING (SIZE(0 | 16..223))

--*****

iscsiDescriptors OBJECT IDENTIFIER ::= { iscsiAdmin 1 }

iscsiHeaderIntegrityTypes OBJECT IDENTIFIER ::= { iscsiDescriptors 1 }

iscsiHdrIntegrityNone OBJECT-IDENTITY

STATUS current

DESCRIPTION

"The authoritative identifier when no integrity scheme for the header is being used."

REFERENCE

"RFC 7143, Section 13.1, HeaderDigest and DataDigest"

::= { iscsiHeaderIntegrityTypes 1 }

iscsiHdrIntegrityCrc32c OBJECT-IDENTITY

STATUS current

DESCRIPTION

"The authoritative identifier when the integrity scheme for the header is CRC32c."

REFERENCE

"RFC 7143, Section 13.1, HeaderDigest and DataDigest"

::= { iscsiHeaderIntegrityTypes 2 }

iscsiDataIntegrityTypes OBJECT IDENTIFIER ::= { iscsiDescriptors 2 }

```

iscsiDataIntegrityNone OBJECT-IDENTITY
    STATUS      current
    DESCRIPTION
        "The authoritative identifier when no integrity
        scheme for the data is being used."
    REFERENCE
        "RFC 7143, Section 13.1, HeaderDigest and DataDigest"
    ::= { iscsiDataIntegrityTypes 1 }

iscsiDataIntegrityCrc32c OBJECT-IDENTITY
    STATUS      current
    DESCRIPTION
        "The authoritative identifier when the integrity
        scheme for the data is CRC32c."
    REFERENCE
        "RFC 7143, Section 13.1, HeaderDigest and DataDigest"
    ::= { iscsiDataIntegrityTypes 2 }

--*****

iscsiInstance OBJECT IDENTIFIER ::= { iscsiObjects 1 }

-- Instance Attributes Table

iscsiInstanceAttributesTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IscsiInstanceAttributesEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "A list of iSCSI instances present on the system."
    ::= { iscsiInstance 1 }

iscsiInstanceAttributesEntry OBJECT-TYPE
    SYNTAX      IscsiInstanceAttributesEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (row) containing management information applicable
        to a particular iSCSI instance."
    INDEX { iscsiInstIndex }
    ::= { iscsiInstanceAttributesTable 1 }

IscsiInstanceAttributesEntry ::= SEQUENCE {
    iscsiInstIndex      Unsigned32,
    iscsiInstDescr      SnmpAdminString,
    iscsiInstVersionMin Unsigned32,
    iscsiInstVersionMax Unsigned32,
    iscsiInstVendorID   SnmpAdminString,

```

```

iscsiInstVendorVersion      SnmpAdminString,
iscsiInstPortalNumber       Unsigned32,
iscsiInstNodeNumber         Unsigned32,
iscsiInstSessionNumber      Unsigned32,
iscsiInstSsnFailures        Counter32,
iscsiInstLastSsnFailureType AutonomousType,
iscsiInstLastSsnRmtNodeName IscsiName,
iscsiInstDiscontinuityTime  TimeStamp,
iscsiInstXNodeArchitecture  SnmpAdminString
}

iscsiInstIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer used to uniquely identify a particular
        iSCSI instance. This index value must not be modified or
        reused by an agent unless a reboot has occurred. An agent
        should attempt to keep this value persistent across reboots."
    ::= { iscsiInstanceAttributesEntry 1 }

iscsiInstDescr OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "A UTF-8 string, determined by the implementation to
        describe the iSCSI instance. When only a single instance
        is present, this object may be set to the zero-length
        string; with multiple iSCSI instances, it may be used in
        an implementation-dependent manner to describe the purpose
        of the respective instance."
    ::= { iscsiInstanceAttributesEntry 2 }

iscsiInstVersionMin OBJECT-TYPE
    SYNTAX      Unsigned32 (0..255)
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The minimum version number of the iSCSI specification
        such that this iSCSI instance supports this minimum
        value, the maximum value indicated by the corresponding
        instance in iscsiInstVersionMax, and all versions in
        between."
    REFERENCE
        "RFC 7143, Section 11.12, Login Request"

```

::= { iscsiInstanceAttributesEntry 3 }

iscsiInstVersionMax OBJECT-TYPE

SYNTAX Unsigned32 (0..255)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum version number of the iSCSI specification such that this iSCSI instance supports this maximum value, the minimum value indicated by the corresponding instance in iscsiInstVersionMin, and all versions in between."

REFERENCE

"RFC 7143, Section 11.12, Login Request"

::= { iscsiInstanceAttributesEntry 4 }

iscsiInstVendorID OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A UTF-8 string describing the manufacturer of the implementation of this instance."

::= { iscsiInstanceAttributesEntry 5 }

iscsiInstVendorVersion OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A UTF-8 string set by the manufacturer describing the version of the implementation of this instance. The format of this string is determined solely by the manufacturer; the string is for informational purposes only. It is unrelated to the iSCSI specification version numbers."

::= { iscsiInstanceAttributesEntry 6 }

iscsiInstPortalNumber OBJECT-TYPE

SYNTAX Unsigned32

UNITS "transport endpoints"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of rows in the iscsiPortalAttributesTable that are currently associated with this iSCSI instance."

::= { iscsiInstanceAttributesEntry 7 }

iscsiInstNodeNumber OBJECT-TYPE

SYNTAX Unsigned32
 UNITS "iSCSI nodes"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The number of rows in the iscsiNodeAttributesTable
 that are currently associated with this iSCSI instance."

::= { iscsiInstanceAttributesEntry 8 }

iscsiInstSessionNumber OBJECT-TYPE

SYNTAX Unsigned32
 UNITS "sessions"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The number of rows in the iscsiSessionAttributesTable
 that are currently associated with this iSCSI instance."

::= { iscsiInstanceAttributesEntry 9 }

iscsiInstSsnFailures OBJECT-TYPE

SYNTAX Counter32
 UNITS "sessions"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"This object counts the number of times a session belonging
 to this instance has failed. If this counter has
 suffered a discontinuity, the time of the last discontinuity
 is indicated in iscsiInstDiscontinuityTime."

REFERENCE

"RFC 7143, Section 13.1, HeaderDigest and DataDigest"

::= { iscsiInstanceAttributesEntry 10 }

iscsiInstLastSsnFailureType OBJECT-TYPE

SYNTAX AutonomousType
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The counter object in the iscsiInstanceSsnErrorStatsTable
 that was incremented when the last session failure occurred."

If the reason for failure is not found in the
 iscsiInstanceSsnErrorStatsTable, the value { 0.0 } is
 used instead."

::= { iscsiInstanceAttributesEntry 11 }

iscsiInstLastSsnRmtNodeName OBJECT-TYPE

SYNTAX IscsiName

```

    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The iSCSI name of the remote node from the failed
        session."
 ::= { iscsiInstanceAttributesEntry 12 }

iscsiInstDiscontinuityTime OBJECT-TYPE
    SYNTAX          TimeStamp
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value of SysUpTime on the most recent occasion
        at which any one or more of this instance's counters
        suffered a discontinuity.

        If no such discontinuities have occurred since the last
        re-initialization of the local management subsystem,
        then this object contains a zero value."
 ::= { iscsiInstanceAttributesEntry 13 }

iscsiInstXNodeArchitecture OBJECT-TYPE
    SYNTAX          SnmpAdminString
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "A UTF-8 string set by the manufacturer declaring the
        details of its iSCSI node architecture to the remote
        endpoint. These details may include, but are not limited
        to, iSCSI vendor software, firmware, or hardware versions,
        the OS version, or hardware architecture.
        The format of this string is determined solely by the
        manufacturer; the string is for informational purposes only.
        It is unrelated to the iSCSI specification version numbers."
    REFERENCE
        "RFC 7143, Section 13.26, X#NodeArchitecture"
 ::= { iscsiInstanceAttributesEntry 14 }

-- Instance Session Failure Stats Table

iscsiInstanceSsnErrorStatsTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF IscsiInstanceSsnErrorStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "Statistics regarding the occurrences of error types
        that result in a session failure."
 ::= { iscsiInstance 2 }

```

```
iscsiInstanceSsnErrorStatsEntry OBJECT-TYPE
    SYNTAX      IscsiInstanceSsnErrorStatsEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (row) containing management information applicable
        to a particular iSCSI instance."
    AUGMENTS { iscsiInstanceAttributesEntry }
 ::= { iscsiInstanceSsnErrorStatsTable 1 }
```

```
IscsiInstanceSsnErrorStatsEntry ::= SEQUENCE {
    iscsiInstSsnDigestErrors      Counter32,
    iscsiInstSsnCxnTimeoutErrors Counter32,
    iscsiInstSsnFormatErrors      Counter32,
    iscsiInstSsnTgtUnmappedErrors Counter32
}
```

```
iscsiInstSsnDigestErrors OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "sessions"
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The count of sessions that failed due to receipt of
        a PDU containing header or data digest errors. If this
        counter has suffered a discontinuity, the time of the last
        discontinuity is indicated in iscsiInstDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 7.8, Digest Errors"
 ::= { iscsiInstanceSsnErrorStatsEntry 1 }
```

```
iscsiInstSsnCxnTimeoutErrors OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "sessions"
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The count of sessions that failed due to a sequence
        exceeding a time limit. If this counter has suffered a
        discontinuity, the time of the last discontinuity
        is indicated in iscsiInstDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 7.5, Connection Timeout Management"
 ::= { iscsiInstanceSsnErrorStatsEntry 2 }
```

```
iscsiInstSsnFormatErrors OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "sessions"
```


MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The count of sessions that failed due to receipt of a PDU that contained a format error. If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiInstDiscontinuityTime."

REFERENCE

"RFC 7143 Section 7.7, Format Errors"

::= { iscsiInstanceSsnErrorStatsEntry 3 }

iscsiInstSsnTgtUnmappedErrors OBJECT-TYPE

SYNTAX Counter32
 UNITS "sessions"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The count of sessions that failed due to the target becoming unmapped. If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiInstDiscontinuityTime."

::= { iscsiInstanceSsnErrorStatsEntry 4 }

--*****

iscsiPortal OBJECT IDENTIFIER ::= { iscsiObjects 2 }

-- Portal Attributes Table

iscsiPortalAttributesTable OBJECT-TYPE

SYNTAX SEQUENCE OF IscsiPortalAttributesEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"A list of transport endpoints (using TCP or another transport protocol) used by this iSCSI instance. An iSCSI instance may use a portal to listen for incoming connections to its targets, to initiate connections to other targets, or both."

::= { iscsiPortal 1 }

iscsiPortalAttributesEntry OBJECT-TYPE

SYNTAX IscsiPortalAttributesEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry (row) containing management information applicable to a particular portal instance."

INDEX { iscsiInstIndex, iscsiPortalIndex }

::= { iscsiPortalAttributesTable 1 }

```

IscsiPortalAttributesEntry ::= SEQUENCE {
    iscsiPortalIndex                Unsigned32,
    iscsiPortalRowStatus            RowStatus,
    iscsiPortalRoles                BITS,
    iscsiPortalAddrType            InetAddressType,
    iscsiPortalAddr                InetAddress,
    iscsiPortalProtocol            IscsiTransportProtocol,
    iscsiPortalMaxRecvDataSegLength Unsigned32,
    iscsiPortalPrimaryHdrDigest    IscsiDigestMethod,
    iscsiPortalPrimaryDataDigest  IscsiDigestMethod,
    iscsiPortalSecondaryHdrDigest IscsiDigestMethod,
    iscsiPortalSecondaryDataDigest IscsiDigestMethod,
    iscsiPortalRecvMarker          TruthValue,
    iscsiPortalStorageType         StorageType,
    iscsiPortalDescr               SnmpAdminString
}

iscsiPortalIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer used to uniquely identify a particular
        transport endpoint within this iSCSI instance. This index
        value must not be modified or reused by an agent unless a
        reboot has occurred. An agent should attempt to keep this
        value persistent across reboots."
    ::= { iscsiPortalAttributesEntry 1 }

iscsiPortalRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "This field allows entries to be dynamically added and
        removed from this table via SNMP. When adding a row to
        this table, all non-Index/RowStatus objects must be set.
        When the value of this object is 'active', the values of
        the other objects in this table cannot be changed.
        Rows may be discarded using RowStatus.

        Note that creating a row in this table will typically
        cause the agent to create one or more rows in the
        iscsiTgtPortalAttributesTable and/or the
        iscsiIntrPortalAttributesTable."
    ::= { iscsiPortalAttributesEntry 2 }

iscsiPortalRoles OBJECT-TYPE

```

```
SYNTAX          BITS {
                    targetTypePortal(0),
                    initiatorTypePortal(1)
                }
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

DESCRIPTION

"A portal can operate in one or both of two roles: as a target portal and/or an initiator portal. If the portal will operate in both roles, both bits must be set.

This object will define a corresponding row that will exist or must be created in the `iscsiTgtPortalAttributesTable`, the `iscsiIntrPortalAttributesTable`, or both. If the `targetTypePortal` bit is set, one or more corresponding `iscsiTgtPortalAttributesEntry` rows will be found or created. If the `initiatorTypePortal` bit is set, one or more corresponding `iscsiIntrPortalAttributesEntry` rows will be found or created. If both bits are set, one or more corresponding rows will be found or created in one of the above tables."

```
::= { iscsiPortalAttributesEntry 3 }
```

iscsiPortalAddrType OBJECT-TYPE

```
SYNTAX          InetAddressType
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

DESCRIPTION

"The type of Internet Network Address contained in the corresponding instance of the `iscsiPortalAddr`."

```
DEFVAL          { ipv4 }
```

```
::= { iscsiPortalAttributesEntry 4 }
```

iscsiPortalAddr OBJECT-TYPE

```
SYNTAX          InetAddress
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

DESCRIPTION

"The portal's Internet Network Address, of the type specified by the object `iscsiPortalAddrType`. If `iscsiPortalAddrType` has the value 'dns', this address gets resolved to an IP address whenever a new iSCSI connection is established using this portal."

```
::= { iscsiPortalAttributesEntry 5 }
```

iscsiPortalProtocol OBJECT-TYPE

```
SYNTAX      IscsiTransportProtocol
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The portal's transport protocol."
DEFVAL      { 6 } -- TCP
 ::= { iscsiPortalAttributesEntry 6 }

iscsiPortalMaxRecvDataSegLength OBJECT-TYPE
SYNTAX      Unsigned32 (512..16777215)
UNITS       "bytes"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The maximum PDU length this portal can receive.
     This may be constrained by hardware characteristics,
     and individual implementations may choose not to
     allow this object to be changed."
REFERENCE
    "RFC 7143, Section 13.12, MaxRecvDataSegmentLength"
DEFVAL      { 8192 }
 ::= { iscsiPortalAttributesEntry 7 }

iscsiPortalPrimaryHdrDigest OBJECT-TYPE
SYNTAX      IscsiDigestMethod
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The preferred header digest for this portal."
DEFVAL      { crc32c }
 ::= { iscsiPortalAttributesEntry 8 }

iscsiPortalPrimaryDataDigest OBJECT-TYPE
SYNTAX      IscsiDigestMethod
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The preferred data digest method for this portal."
DEFVAL      { crc32c }
 ::= { iscsiPortalAttributesEntry 9 }

iscsiPortalSecondaryHdrDigest OBJECT-TYPE
SYNTAX      IscsiDigestMethod
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "An alternate header digest preference for this portal."
DEFVAL      { noDigest }
```

```
::= { iscsiPortalAttributesEntry 10 }
```

```
iscsiPortalSecondaryDataDigest OBJECT-TYPE
```

```
SYNTAX          IscsiDigestMethod
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

```
DESCRIPTION
```

```
"An alternate data digest preference for this portal."
```

```
DEFVAL          { noDigest }
```

```
::= { iscsiPortalAttributesEntry 11 }
```

```
iscsiPortalRecvMarker OBJECT-TYPE
```

```
SYNTAX          TruthValue
```

```
MAX-ACCESS      read-create
```

```
STATUS          deprecated
```

```
DESCRIPTION
```

```
"This object indicates whether or not this portal will  
request markers in its incoming data stream."
```

```
REFERENCE
```

```
"RFC 7143, Section 13.25, Obsoleted Keys."
```

```
DEFVAL          { false }
```

```
::= { iscsiPortalAttributesEntry 12 }
```

```
iscsiPortalStorageType OBJECT-TYPE
```

```
SYNTAX          StorageType
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

```
DESCRIPTION
```

```
"The storage type for this row. Rows in this table that were  
created through an external process (e.g., not created via  
this MIB) may have a storage type of readOnly or permanent.
```

```
Conceptual rows having the value 'permanent' need not  
allow write access to any columnar objects in the row."
```

```
DEFVAL          { nonVolatile }
```

```
::= { iscsiPortalAttributesEntry 13 }
```

```
iscsiPortalDescr OBJECT-TYPE
```

```
SYNTAX          SnmpAdminString
```

```
MAX-ACCESS      read-only
```

```
STATUS          current
```

```
DESCRIPTION
```

```
"A UTF-8 string, determined by the implementation to  
describe the iSCSI portal. When only a single instance  
is present, this object may be set to the zero-length  
string; with multiple iSCSI portals, it may be used in  
an implementation-dependent manner to describe the  
respective portal, and could include information such as
```

Host Bus Adapter (HBA) model, description, and version, or software driver and version."
 ::= { iscsiPortalAttributesEntry 14 }

--*****
 iscsiTargetPortal OBJECT IDENTIFIER ::= { iscsiObjects 3 }

-- Target Portal Attributes Table

iscsiTgtPortalAttributesTable OBJECT-TYPE
 SYNTAX SEQUENCE OF IscsiTgtPortalAttributesEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "A list of transport endpoints (using TCP or another transport protocol) on which this iSCSI instance listens for incoming connections to its targets."
 ::= { iscsiTargetPortal 1 }

iscsiTgtPortalAttributesEntry OBJECT-TYPE
 SYNTAX IscsiTgtPortalAttributesEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry (row) containing management information applicable to a particular portal instance that is used to listen for incoming connections to local targets. One or more rows in this table is populated by the agent for each iscsiPortalAttributesEntry row that has the bit targetTypePortal set in its iscsiPortalRoles column."
 INDEX { iscsiInstIndex, iscsiPortalIndex, iscsiTgtPortalNodeIndexOrZero }
 ::= { iscsiTgtPortalAttributesTable 1 }

IscliTgtPortalAttributesEntry ::= SEQUENCE {
 iscsiTgtPortalNodeIndexOrZero Unsigned32,
 iscsiTgtPortalPort InetPortNumber,
 iscsiTgtPortalTag Unsigned32
 }

iscsiTgtPortalNodeIndexOrZero OBJECT-TYPE
 SYNTAX Unsigned32 (0..4294967295)
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An arbitrary integer used to uniquely identify a particular node within an iSCSI instance present on the local system."

For implementations where each {portal, node} tuple can have a different portal tag, this value will map to the iscsiNodeIndex.

For implementations where the portal tag is the same for a given portal regardless of which node is using the portal, the value 0 (zero) is used."

```
::= { iscsiTgtPortalAttributesEntry 1 }
```

```
iscsiTgtPortalPort OBJECT-TYPE
```

```
SYNTAX      InetPortNumber (1..65535)
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"The portal's transport protocol port number on which the portal listens for incoming iSCSI connections when the portal is used as a target portal. This object's storage type is specified in iscsiPortalStorageType."

```
::= { iscsiTgtPortalAttributesEntry 2 }
```

```
iscsiTgtPortalTag OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (1..65535)
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"The portal's aggregation tag when the portal is used as a target portal. Multiple-connection sessions may be aggregated over portals sharing an identical aggregation tag. This object's storage type is specified in iscsiPortalStorageType."

```
REFERENCE
```

"RFC 7143, Section 4.4.1, iSCSI Architecture Model"

```
::= { iscsiTgtPortalAttributesEntry 3 }
```

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

```
iscsiInitiatorPortal OBJECT IDENTIFIER ::= { iscsiObjects 4 }
```

```
-- Initiator Portal Attributes Table
```

```
iscsiIntrPortalAttributesTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF IscsiIntrPortalAttributesEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

"A list of Internet Network Addresses (using TCP or another transport protocol) from which this iSCSI instance may initiate connections to other targets."

```
::= { iscsiInitiatorPortal 1 }
```

```
iscsiIntrPortalAttributesEntry OBJECT-TYPE
```

```
SYNTAX      IscsiIntrPortalAttributesEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

"An entry (row) containing management information applicable to a particular portal instance that is used to initiate connections to iSCSI targets. One or more rows in this table is populated by the agent for each iscsiPortalAttributesEntry row that has the bit initiatorTypePortal set in its iscsiPortalRoles column."

```
INDEX { iscsiInstIndex, iscsiPortalIndex,
        iscsiIntrPortalNodeIndexOrZero }
```

```
::= { iscsiIntrPortalAttributesTable 1 }
```

```
IscsiIntrPortalAttributesEntry ::= SEQUENCE {
    iscsiIntrPortalNodeIndexOrZero Unsigned32,
    iscsiIntrPortalTag              Unsigned32
}
```

```
iscsiIntrPortalNodeIndexOrZero OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (0..4294967295)
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

"An arbitrary integer used to uniquely identify a particular node within an iSCSI instance present on the local system."

For implementations where each {portal, node} tuple can have a different portal tag, this value will map to the iscsiNodeIndex.

For implementations where the portal tag is the same for a given portal regardless of which node is using the portal, the value 0 (zero) is used."

```
::= { iscsiIntrPortalAttributesEntry 1 }
```

```
iscsiIntrPortalTag OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (1..65535)
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"The portal's aggregation tag when the portal is used as an initiator portal. Multiple-connection sessions may be aggregated over portals sharing an identical

aggregation tag. This object's storage type is specified in `iscsiPortalStorageType`."

REFERENCE

"RFC 7143, Section 4.4.1, iSCSI Architecture Model"

::= { `iscsiIntrPortalAttributesEntry` 2 }

--*****

`iscsiNode` OBJECT IDENTIFIER ::= { `iscsiObjects` 5 }

-- Node Attributes Table

`iscsiNodeAttributesTable` OBJECT-TYPE

SYNTAX SEQUENCE OF `IscsiNodeAttributesEntry`

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A list of iSCSI nodes belonging to each iSCSI instance present on the local system. An iSCSI node can act as an initiator, a target, or both."

::= { `iscsiNode` 1 }

`iscsiNodeAttributesEntry` OBJECT-TYPE

SYNTAX `IscsiNodeAttributesEntry`

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A conceptual row containing management information applicable to a particular iSCSI node."

INDEX { `iscsiInstIndex`, `iscsiNodeIndex` }

::= { `iscsiNodeAttributesTable` 1 }

`IscsiNodeAttributesEntry` ::= SEQUENCE {

<code>iscsiNodeIndex</code>	Unsigned32,
<code>iscsiNodeName</code>	<code>IscsiName</code> ,
<code>iscsiNodeAlias</code>	<code>SnmpAdminString</code> ,
<code>iscsiNodeRoles</code>	BITS,
<code>iscsiNodeTransportType</code>	<code>RowPointer</code> ,
<code>iscsiNodeInitialR2T</code>	<code>TruthValue</code> ,
<code>iscsiNodeImmediateData</code>	<code>TruthValue</code> ,
<code>iscsiNodeMaxOutstandingR2T</code>	Unsigned32,
<code>iscsiNodeFirstBurstLength</code>	Unsigned32,
<code>iscsiNodeMaxBurstLength</code>	Unsigned32,
<code>iscsiNodeMaxConnections</code>	Unsigned32,
<code>iscsiNodeDataSequenceInOrder</code>	<code>TruthValue</code> ,
<code>iscsiNodeDataPDUInOrder</code>	<code>TruthValue</code> ,
<code>iscsiNodeDefaultTime2Wait</code>	Unsigned32,
<code>iscsiNodeDefaultTime2Retain</code>	Unsigned32,

```

    iscsiNodeErrorRecoveryLevel      Unsigned32,
    iscsiNodeDiscontinuityTime      TimeStamp,
    iscsiNodeStorageType             StorageType
}

iscsiNodeIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer used to uniquely identify a particular
        node within an iSCSI instance. This index value must not be
        modified or reused by an agent unless a reboot has occurred.
        An agent should attempt to keep this value persistent across
        reboots."
 ::= { iscsiNodeAttributesEntry 1 }

iscsiNodeName OBJECT-TYPE
    SYNTAX      IscsiName
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "This node's iSCSI name, which is independent of the location
        of the node, and can be resolved into a set of addresses
        through various discovery services."
 ::= { iscsiNodeAttributesEntry 2 }

iscsiNodeAlias OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "A character string that is a human-readable name or
        description of the iSCSI node. If configured, this alias
        may be communicated to the initiator or target node at
        the remote end of the connection during a Login Request
        or Response message. This string is not used as an
        identifier, but it can be displayed by the system's user
        interface in a list of initiators and/or targets to
        which it is connected.

        If no alias exists, the value is a zero-length string."
    REFERENCE
        "RFC 7143, Sections 13.6 (TargetAlias) and 13.7
        (InitiatorAlias)"
 ::= { iscsiNodeAttributesEntry 3 }

iscsiNodeRoles OBJECT-TYPE

```

SYNTAX BITS {
 targetTypeNode(0),
 initiatorTypeNode(1)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A node can operate in one or both of two roles:
a target role and/or an initiator role. If the node
will operate in both roles, both bits must be set.

This object will also define the corresponding rows that
will exist in the iscsiTargetAttributesTable, the
iscsiInitiatorAttributesTable, or both. If the
targetTypeNode bit is set, there will be a corresponding
iscsiTargetAttributesEntry. If the initiatorTypeNode bit
is set, there will be a corresponding
iscsiInitiatorAttributesEntry. If both bits are set,
there will be a corresponding iscsiTgtPortalAttributesEntry
and iscsiPortalAttributesEntry."

::= { iscsiNodeAttributesEntry 4 }

iscsiNodeTransportType OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A pointer to the corresponding row in the appropriate
table for this SCSI transport, thereby allowing management
stations to locate the SCSI-level device that is represented
by this iscsiNode. For example, it will usually point to the
corresponding scsiTrnspt object in the SCSI MIB module.
If no corresponding row exists, the value 0.0 must be
used to indicate this."

REFERENCE

"SCSI-MIB, RFC 4455, Section 9, Object Definitions,
scsiTransportTypes"

::= { iscsiNodeAttributesEntry 5 }

iscsiNodeInitialR2T OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object indicates the InitialR2T preference for this
node:

true = YES,

false = will try to negotiate NO, will accept YES "

REFERENCE

"RFC 7143, Section 13.10, InitialR2T"

::= { iscsiNodeAttributesEntry 6 }

iscsiNodeImmediateData OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object indicates ImmediateData preference for this node:

true = YES (but will accept NO),

false = NO "

REFERENCE

"RFC 7143, Section 13.11, ImmediateData"

DEFVAL { true }

::= { iscsiNodeAttributesEntry 7 }

iscsiNodeMaxOutstandingR2T OBJECT-TYPE

SYNTAX Unsigned32 (1..65535)

UNITS "R2Ts"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Maximum number of outstanding requests-to-transmit (R2Ts) allowed per iSCSI task."

REFERENCE

"RFC 7143, Section 13.17, MaxOutstandingR2T"

DEFVAL { 1 }

::= { iscsiNodeAttributesEntry 8 }

iscsiNodeFirstBurstLength OBJECT-TYPE

SYNTAX Unsigned32 (512..16777215)

UNITS "bytes"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The maximum length (bytes) supported for unsolicited data to/from this node."

REFERENCE

"RFC 7143, Section 13.14, FirstBurstLength"

DEFVAL { 65536 }

::= { iscsiNodeAttributesEntry 9 }

iscsiNodeMaxBurstLength OBJECT-TYPE

SYNTAX Unsigned32 (512..16777215)

UNITS "bytes"

MAX-ACCESS read-write

```
STATUS          current
DESCRIPTION
  "The maximum number of bytes that can be sent within
  a single sequence of Data-In or Data-Out PDUs."
REFERENCE
  "RFC 7143, Section 13.13, MaxBurstLength"
DEFVAL          { 262144 }
 ::= { iscsiNodeAttributesEntry 10 }

iscsiNodeMaxConnections OBJECT-TYPE
SYNTAX          Unsigned32 (1..65535)
UNITS           "connections"
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
  "The maximum number of connections allowed in each
  session to and/or from this node."
REFERENCE
  "RFC 7143, Section 13.2, MaxConnections"
DEFVAL          { 1 }
 ::= { iscsiNodeAttributesEntry 11 }

iscsiNodeDataSequenceInOrder OBJECT-TYPE
SYNTAX          TruthValue
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
  "The DataSequenceInOrder preference of this node.
  False (=No) indicates that iSCSI data PDU sequences may
  be transferred in any order. True (=Yes) indicates that
  data PDU sequences must be transferred using
  continuously increasing offsets, except during
  error recovery."
REFERENCE
  "RFC 7143, Section 13.19, DataSequenceInOrder"
DEFVAL          { true }
 ::= { iscsiNodeAttributesEntry 12 }

iscsiNodeDataPDUIInOrder OBJECT-TYPE
SYNTAX          TruthValue
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
  "The DataPDUIInOrder preference of this node.
  False (=No) indicates that iSCSI data PDUs within sequences
  may be in any order. True (=Yes) indicates that data PDUs
  within sequences must be at continuously increasing
  addresses, with no gaps or overlay between PDUs."
```

REFERENCE

"RFC 7143, Section 13.18, DataPDUInOrder"

DEFVAL { true }

::= { iscsiNodeAttributesEntry 13 }

iscsiNodeDefaultTime2Wait OBJECT-TYPE

SYNTAX Unsigned32 (0..3600)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The DefaultTime2Wait preference of this node. This is the minimum time, in seconds, to wait before attempting an explicit/implicit logout or active iSCSI task reassignment after an unexpected connection termination or a connection reset."

REFERENCE

"RFC 7143, Section 13.15, DefaultTime2Wait"

DEFVAL { 2 }

::= { iscsiNodeAttributesEntry 14 }

iscsiNodeDefaultTime2Retain OBJECT-TYPE

SYNTAX Unsigned32 (0..3600)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The DefaultTime2Retain preference of this node. This is the maximum time, in seconds after an initial wait (Time2Wait), before which an active iSCSI task reassignment is still possible after an unexpected connection termination or a connection reset."

REFERENCE

"RFC 7143, Section 13.16, DefaultTime2Retain"

DEFVAL { 20 }

::= { iscsiNodeAttributesEntry 15 }

iscsiNodeErrorRecoveryLevel OBJECT-TYPE

SYNTAX Unsigned32 (0..255)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The ErrorRecoveryLevel preference of this node. Currently, only 0-2 are valid."

This object is designed to accommodate future error-recovery levels.

Higher error-recovery levels imply support in addition to support for the lower error level functions. In other words, error level 2 implies support for levels 0-1, since those functions are subsets of error level 2."

REFERENCE

"RFC 7143, Section 13.20, ErrorRecoveryLevel"

DEFVAL { 0 }

::= { iscsiNodeAttributesEntry 16 }

iscsiNodeDiscontinuityTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of SysUpTime on the most recent occasion at which any one or more of this node's counters suffered a discontinuity.

If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."

::= { iscsiNodeAttributesEntry 17 }

iscsiNodeStorageType OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The storage type for all read-write objects within this row. Rows in this table are always created via an external process (e.g., not created via this MIB module). Conceptual rows having the value 'permanent' need not allow Write access to any columnar objects in the row.

If this object has the value 'volatile', modifications to read-write objects in this row are not persistent across reboots. If this object has the value 'nonVolatile', modifications to objects in this row are persistent.

An implementation may choose to allow this object to be set to either 'nonVolatile' or 'volatile', allowing the management application to choose this behavior."

DEFVAL { volatile }

::= { iscsiNodeAttributesEntry 18 }

--*****

iscsiTarget OBJECT IDENTIFIER ::= { iscsiObjects 6 }

-- Target Attributes Table

iscsiTargetAttributesTable OBJECT-TYPE

SYNTAX SEQUENCE OF IscsiTargetAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A list of iSCSI nodes that can take on a target role, belonging to each iSCSI instance present on the local system."

::= { iscsiTarget 1 }

iscsiTargetAttributesEntry OBJECT-TYPE

SYNTAX IscsiTargetAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (row) containing management information applicable to a particular node that can take on a target role."

INDEX { iscsiInstIndex, iscsiNodeIndex }

::= { iscsiTargetAttributesTable 1 }

IscsiTargetAttributesEntry ::= SEQUENCE {

iscsiTgtLoginFailures Counter32,

iscsiTgtLastFailureTime TimeStamp,

iscsiTgtLastFailureType AutonomousType,

iscsiTgtLastIntrFailureName IscsiName,

iscsiTgtLastIntrFailureAddrType InetAddressType,

iscsiTgtLastIntrFailureAddr InetAddress,

iscsiTgtLastIntrFailurePort InetPortNumber

}

iscsiTgtLoginFailures OBJECT-TYPE

SYNTAX Counter32

UNITS "failed login attempts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object counts the number of times a login attempt to this local target has failed.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiTargetAttributesEntry 1 }

iscsiTgtLastFailureTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The timestamp of the most recent failure of a login attempt to this target. A value of zero indicates that no such failures have occurred since the last system boot."

::= { iscsiTargetAttributesEntry 2 }

iscsiTgtLastFailureType OBJECT-TYPE

SYNTAX AutonomousType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of the most recent failure of a login attempt to this target, represented as the OID of the counter object in iscsiTargetLoginStatsTable for which the relevant instance was incremented. If no such failures have occurred since the last system boot, this attribute will have the value 0.0. A value of 0.0 may also be used to indicate a type that is not represented by any of the counters in iscsiTargetLoginStatsTable."

::= { iscsiTargetAttributesEntry 3 }

iscsiTgtLastIntrFailureName OBJECT-TYPE

SYNTAX IscsiName

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The iSCSI name of the initiator that failed the last login attempt. If no such failures have occurred since the last system boot, this value is a zero-length string."

::= { iscsiTargetAttributesEntry 4 }

iscsiTgtLastIntrFailureAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of Internet Network Address contained in the corresponding instance of the iscsiTgtLastIntrFailureAddr. The value 'dns' is not allowed. If no such failures have occurred since the last system boot, this value is zero."

::= { iscsiTargetAttributesEntry 5 }

iscsiTgtLastIntrFailureAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"An Internet Network Address, of the type specified by the object `iscsiTgtLastIntrFailureAddrType`, giving the host address of the initiator that failed the last login attempt. If no such failures have occurred since the last system boot, this value is a zero-length string."

::= { iscsiTargetAttributesEntry 6 }

`iscsiTgtLastIntrFailurePort` OBJECT-TYPE

SYNTAX InetPortNumber
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The transport protocol port number used by the initiator that failed the last login attempt. If no such failures have occurred since the last system boot, this value is a zero-length string."

::= { iscsiTargetAttributesEntry 7 }

-- Target Login Stats Table

`iscsiTargetLoginStatsTable` OBJECT-TYPE

SYNTAX SEQUENCE OF `IscsiTargetLoginStatsEntry`
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"A table of counters that keep a record of the results of initiators' login attempts to this target."

::= { iscsiTarget 2 }

`iscsiTargetLoginStatsEntry` OBJECT-TYPE

SYNTAX `IscsiTargetLoginStatsEntry`
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry (row) containing counters for each result of a login attempt to this target."

AUGMENTS { `iscsiTargetAttributesEntry` }

::= { `iscsiTargetLoginStatsTable` 1 }

`IscsiTargetLoginStatsEntry` ::= SEQUENCE {

`iscsiTgtLoginAccepts` Counter32,
`iscsiTgtLoginOtherFails` Counter32,
`iscsiTgtLoginRedirects` Counter32,
`iscsiTgtLoginAuthorizeFails` Counter32,
`iscsiTgtLoginAuthenticateFails` Counter32,

```

    iscsiTgtLoginNegotiateFails    Counter32
}

iscsiTgtLoginAccepts OBJECT-TYPE
    SYNTAX      Counter32
    UNITS       "successful logins"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The count of Login Response PDUs with status
        0x0000, Accept Login, transmitted by this
        target.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiNodeDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 11.13.5, Status-Class and Status-Detail"
    ::= { iscsiTargetLoginStatsEntry 1 }

iscsiTgtLoginOtherFails OBJECT-TYPE
    SYNTAX      Counter32
    UNITS       "failed logins"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of Login Response PDUs that were transmitted
        by this target and that were not counted by any other
        object in the row.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiNodeDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 11.13.5, Status-Class and Status-Detail"
    ::= { iscsiTargetLoginStatsEntry 2 }

iscsiTgtLoginRedirects OBJECT-TYPE
    SYNTAX      Counter32
    UNITS       "redirected logins"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The count of Login Response PDUs with status class 0x01,
        Redirection, transmitted by this target.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiNodeDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 11.13.5, Status-Class and Status-Detail"
    ::= { iscsiTargetLoginStatsEntry 3 }

iscsiTgtLoginAuthorizeFails OBJECT-TYPE

```

SYNTAX Counter32
UNITS "failed logins"
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The count of Login Response PDUs with status 0x0202, Forbidden Target, transmitted by this target.

If this counter is incremented, an iscsiTgtLoginFailure notification should be generated.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiTargetLoginStatsEntry 4 }

iscsiTgtLoginAuthenticateFails OBJECT-TYPE

SYNTAX Counter32
UNITS "failed logins"
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The count of Login Response PDUs with status 0x0201, Authentication Failed, transmitted by this target.

If this counter is incremented, an iscsiTgtLoginFailure notification should be generated.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiTargetLoginStatsEntry 5 }

iscsiTgtLoginNegotiateFails OBJECT-TYPE

SYNTAX Counter32
UNITS "failed logins"
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The number of times a target has effectively refused a login because the parameter negotiation failed.

If this counter is incremented, an iscsiTgtLoginFailure notification should be generated.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

::= { iscsiTargetLoginStatsEntry 6 }

-- Target Logout Stats Table**iscsiTargetLogoutStatsTable OBJECT-TYPE**

SYNTAX SEQUENCE OF IscsiTargetLogoutStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"When a target receives a Logout command, it responds with a Logout Response that carries a status code.

This table contains counters for both normal and abnormal Logout Requests received by this target."

::= { iscsiTarget 3 }

iscsiTargetLogoutStatsEntry OBJECT-TYPE

SYNTAX IscsiTargetLogoutStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (row) containing counters of Logout Response

PDU's that were received by this target."

AUGMENTS { iscsiTargetAttributesEntry }

::= { iscsiTargetLogoutStatsTable 1 }

IscsiTargetLogoutStatsEntry ::= SEQUENCE {

iscsiTgtLogoutNormals Counter32,

iscsiTgtLogoutOthers Counter32,

iscsiTgtLogoutCxnClosed Counter32,

iscsiTgtLogoutCxnRemoved Counter32

}**iscsiTgtLogoutNormals OBJECT-TYPE**

SYNTAX Counter32

UNITS "normal logouts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Logout Command PDU's received by this target, with reason code 0 (closes the session).

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.14.1, Reason Code"

::= { iscsiTargetLogoutStatsEntry 1 }

iscsiTgtLogoutOthers OBJECT-TYPE

SYNTAX Counter32

UNITS "abnormal logouts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Logout Command PDUs received by this target, with any reason code other than 0.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.14.1, Reason Code"

::= { iscsiTargetLogoutStatsEntry 2 }

iscsiTgtLogoutCxnClosed OBJECT-TYPE

SYNTAX Counter32

UNITS "abnormal logouts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Logout Command PDUs received by this target, with reason code 1 (closes the connection).

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.14.1, Reason Code"

::= { iscsiTargetLogoutStatsEntry 3 }

iscsiTgtLogoutCxnRemoved OBJECT-TYPE

SYNTAX Counter32

UNITS "abnormal logouts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Logout Command PDUs received by this target, with reason code 2 (removes the connection).

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.14.1, Reason Code"

::= { iscsiTargetLogoutStatsEntry 4 }

--*****

iscsiTgtAuthorization OBJECT IDENTIFIER ::= { iscsiObjects 7 }

-- Target Authorization Attributes Table

iscsiTgtAuthAttributesTable OBJECT-TYPE

SYNTAX SEQUENCE OF IscsiTgtAuthAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A list of initiator identities that are authorized to access each target node within each iSCSI instance present on the local system."

::= { iscsiTgtAuthorization 1 }

iscsiTgtAuthAttributesEntry OBJECT-TYPE

SYNTAX IscsiTgtAuthAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (row) containing management information applicable to a particular target node's authorized initiator identity."

INDEX { iscsiInstIndex, iscsiNodeIndex, iscsiTgtAuthIndex }

::= { iscsiTgtAuthAttributesTable 1 }

IscsiTgtAuthAttributesEntry ::= SEQUENCE {

iscsiTgtAuthIndex Unsigned32,

iscsiTgtAuthRowStatus RowStatus,

iscsiTgtAuthIdentity RowPointer,

iscsiTgtAuthStorageType StorageType

}

iscsiTgtAuthIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An arbitrary integer used to uniquely identify a particular target's authorized initiator identity within an iSCSI instance present on the local system. This index value must not be modified or reused by an agent unless a reboot has occurred. An agent should attempt to keep this value persistent across reboots."

::= { iscsiTgtAuthAttributesEntry 1 }

iscsiTgtAuthRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This field allows entries to be dynamically added and removed from this table via SNMP. When adding a row to this table, all non-Index/RowStatus objects must be set. When the value of this object is 'active', the values of the other objects in this table cannot be changed. Rows may be discarded using RowStatus."

```
::= { iscsiTgtAuthAttributesEntry 2 }
```

```
iscsiTgtAuthIdentity OBJECT-TYPE
```

```
SYNTAX          RowPointer
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
```

```
"A pointer to the corresponding user entry in the IPS-AUTH
MIB module that will be allowed to access this iSCSI target."
```

```
REFERENCE
```

```
"IPS-AUTH MIB, RFC 4545, Section 7.3, ipsAuthIdentity"
```

```
::= { iscsiTgtAuthAttributesEntry 3 }
```

```
iscsiTgtAuthStorageType OBJECT-TYPE
```

```
SYNTAX          StorageType
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
```

```
"The storage type for this row. Rows in this table that were
created through an external process (e.g., not created via
this MIB) may have a storage type of readOnly or permanent.
```

```
Conceptual rows having the value 'permanent' need not
allow write access to any columnar objects in the row."
```

```
DEFVAL          { nonVolatile }
```

```
::= { iscsiTgtAuthAttributesEntry 4 }
```

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

```
iscsiInitiator OBJECT IDENTIFIER ::= { iscsiObjects 8 }
```

```
-- Initiator Attributes Table
```

```
iscsiInitiatorAttributesTable OBJECT-TYPE
```

```
SYNTAX          SEQUENCE OF IscsiInitiatorAttributesEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
```

```
"A list of iSCSI nodes that can take on an initiator
role, belonging to each iSCSI instance present on
the local system."
```

```
::= { iscsiInitiator 1 }
```

```
iscsiInitiatorAttributesEntry OBJECT-TYPE
```

```
SYNTAX          IscsiInitiatorAttributesEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
```


"An entry (row) containing management information applicable to a particular iSCSI node that has initiator capabilities."

```
INDEX { iscsiInstIndex, iscsiNodeIndex }
 ::= { iscsiInitiatorAttributesTable 1 }
```

```
IscsiInitiatorAttributesEntry ::= SEQUENCE {
    iscsiIntrLoginFailures      Counter32,
    iscsiIntrLastFailureTime    TimeStamp,
    iscsiIntrLastFailureType    AutonomousType,
    iscsiIntrLastTgtFailureName IscsiName,
    iscsiIntrLastTgtFailureAddr InetAddressType,
    iscsiIntrLastTgtFailureAddr InetAddress,
    iscsiIntrLastTgtFailurePort InetPortNumber
}
```

iscsiIntrLoginFailures OBJECT-TYPE

```
SYNTAX      Counter32
UNITS        "failed logins"
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
```

"This object counts the number of times a login attempt from this local initiator has failed.
If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

```
::= { iscsiInitiatorAttributesEntry 1 }
```

iscsiIntrLastFailureTime OBJECT-TYPE

```
SYNTAX      TimeStamp
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
```

"The timestamp of the most recent failure of a login attempt from this initiator. A value of zero indicates that no such failures have occurred since the last system boot."

```
::= { iscsiInitiatorAttributesEntry 2 }
```

iscsiIntrLastFailureType OBJECT-TYPE

```
SYNTAX      AutonomousType
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
```

"The type of the most recent failure of a login attempt from this initiator, represented as the OID of the counter object in iscsiInitiatorLoginStatsTable for which the

relevant instance was incremented. If no such failures have occurred since the last system boot, this attribute will have the value 0.0. A value of 0.0 may also be used to indicate a type that is not represented by any of the counters in `iscsiInitiatorLoginStatsTable`."

::= { iscsiInitiatorAttributesEntry 3 }

`iscsiIntrLastTgtFailureName` OBJECT-TYPE

SYNTAX IscsiName

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A UTF-8 string giving the name of the target that failed the last login attempt. If no such failures have occurred since the last system boot, this value is a zero-length string."

::= { iscsiInitiatorAttributesEntry 4 }

`iscsiIntrLastTgtFailureAddrType` OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of Internet Network Address contained in the corresponding instance of the `iscsiIntrLastTgtFailureAddr`. The value 'dns' is not allowed. If no such failures have occurred since the last system boot, this value is zero."

::= { iscsiInitiatorAttributesEntry 5 }

`iscsiIntrLastTgtFailureAddr` OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An Internet Network Address, of the type specified by the object `iscsiIntrLastTgtFailureAddrType`, giving the host address of the target that failed the last login attempt. If no such failures have occurred since the last system boot, this value is a zero-length string."

::= { iscsiInitiatorAttributesEntry 6 }

`iscsiIntrLastTgtFailurePort` OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The transport protocol port number used by the target that failed the last login attempt. If no such failures have occurred since the last system boot,

```

        this value is a zero-length string."
 ::= { iscsiInitiatorAttributesEntry 7 }

-- Initiator Login Stats Table

iscsiInitiatorLoginStatsTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF IscsiInitiatorLoginStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "A table of counters that keep track of the results of
        this initiator's login attempts."
 ::= { iscsiInitiator 2 }

iscsiInitiatorLoginStatsEntry OBJECT-TYPE
    SYNTAX          IscsiInitiatorLoginStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry (row) containing counters of each result
        of this initiator's login attempts."
    AUGMENTS { iscsiInitiatorAttributesEntry }
 ::= { iscsiInitiatorLoginStatsTable 1 }

IscsiInitiatorLoginStatsEntry ::= SEQUENCE {
    iscsiIntrLoginAcceptRsps          Counter32,
    iscsiIntrLoginOtherFailRsps      Counter32,
    iscsiIntrLoginRedirectRsps       Counter32,
    iscsiIntrLoginAuthFailRsps       Counter32,
    iscsiIntrLoginAuthenticateFails Counter32,
    iscsiIntrLoginNegotiateFails     Counter32,
    iscsiIntrLoginAuthorizeFails     Counter32
}

iscsiIntrLoginAcceptRsps OBJECT-TYPE
    SYNTAX          Counter32
    UNITS           "successful logins"
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The count of Login Response PDUs with status
        0x0000, Accept Login, received by this initiator.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiNodeDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 11.13.5, Status-Class and Status-Detail"
 ::= { iscsiInitiatorLoginStatsEntry 1 }

```

iscsiIntrLoginOtherFailRsps OBJECT-TYPE

SYNTAX Counter32

UNITS "failed logins"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Login Response PDUs received by this initiator with any status code not counted in the objects below.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiInitiatorLoginStatsEntry 2 }**iscsiIntrLoginRedirectRsps OBJECT-TYPE**

SYNTAX Counter32

UNITS "failed logins"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Login Response PDUs with status class 0x01, Redirection, received by this initiator.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiInitiatorLoginStatsEntry 3 }**iscsiIntrLoginAuthFailRsps OBJECT-TYPE**

SYNTAX Counter32

UNITS "failed logins"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Login Response PDUs with status class 0x201, Authentication Failed, received by this initiator.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiInitiatorLoginStatsEntry 4 }**iscsiIntrLoginAuthenticateFails OBJECT-TYPE**

SYNTAX Counter32

UNITS "failed logins"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times the initiator has aborted a login because the target could not be authenticated.

No response is generated.

If this counter is incremented, an `iscsiIntrLoginFailure` notification should be generated.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in `iscsiNodeDiscontinuityTime`."

REFERENCE

"RFC 7143, Section 11.13.5, Status-Class and Status-Detail"

::= { iscsiInitiatorLoginStatsEntry 5 }

iscsiIntrLoginNegotiateFails OBJECT-TYPE

SYNTAX Counter32

UNITS "failed logins"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times the initiator has aborted a login because parameter negotiation with the target failed.

No response is generated.

If this counter is incremented, an `iscsiIntrLoginFailure` notification should be generated.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in `iscsiNodeDiscontinuityTime`."

REFERENCE

"RFC 7143, Section 7.12, Negotiation Failures"

::= { iscsiInitiatorLoginStatsEntry 6 }

iscsiIntrLoginAuthorizeFails OBJECT-TYPE

SYNTAX Counter32

UNITS "failed logins"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Login Response PDUs with status 0x0202, Forbidden Target, received by this initiator.

If this counter is incremented, an `iscsiIntrLoginFailure` notification should be generated.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in `iscsiNodeDiscontinuityTime`."

REFERENCE

```

    "RFC 7143, Section 11.13.5, Status-Class and Status-Detail"
 ::= { iscsiInitiatorLoginStatsEntry 7 }

-- Initiator Logout Stats Table

iscsiInitiatorLogoutStatsTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF IscsiInitiatorLogoutStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "When an initiator attempts to send a Logout command, the target
        responds with a Logout Response that carries a status code.
        This table contains a list of counters of Logout Response
        PDUs of each status code that was received by each
        initiator belonging to this iSCSI instance present on this
        system."
 ::= { iscsiInitiator 3 }

iscsiInitiatorLogoutStatsEntry OBJECT-TYPE
    SYNTAX          IscsiInitiatorLogoutStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry (row) containing counters of Logout Response
        PDUs of each status code that was generated by this
        initiator."
    AUGMENTS { iscsiInitiatorAttributesEntry }
 ::= { iscsiInitiatorLogoutStatsTable 1 }

IscsiInitiatorLogoutStatsEntry ::= SEQUENCE {
    iscsiIntrLogoutNormals      Counter32,
    iscsiIntrLogoutOthers      Counter32
}

iscsiIntrLogoutNormals OBJECT-TYPE
    SYNTAX          Counter32
    UNITS           "normal logouts"
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The count of Logout Command PDUs generated by this initiator
        with reason code 0 (closes the session).
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiNodeDiscontinuityTime."
    REFERENCE
        "RFC 7143, Section 11.14.1, Reason Code"
 ::= { iscsiInitiatorLogoutStatsEntry 1 }

```

iscsiIntrLogoutOthers OBJECT-TYPE

SYNTAX Counter32

UNITS "abnormal logouts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of Logout Command PDUs generated by this initiator with any status code other than 0.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiNodeDiscontinuityTime."

REFERENCE

"RFC 7143, Section 11.14.1, Reason Code"

::= { iscsiInitiatorLogoutStatsEntry 2 }

--*****

iscsiIntrAuthorization OBJECT IDENTIFIER ::= { iscsiObjects 9 }

-- Initiator Authorization Attributes Table

iscsiIntrAuthAttributesTable OBJECT-TYPE

SYNTAX SEQUENCE OF IscsiIntrAuthAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A list of target identities that each initiator on the local system may access."

::= { iscsiIntrAuthorization 1 }

iscsiIntrAuthAttributesEntry OBJECT-TYPE

SYNTAX IscsiIntrAuthAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (row) containing management information applicable to a particular initiator node's authorized target identity."

INDEX { iscsiInstIndex, iscsiNodeIndex, iscsiIntrAuthIndex }

::= { iscsiIntrAuthAttributesTable 1 }

IscsiIntrAuthAttributesEntry ::= SEQUENCE {

iscsiIntrAuthIndex Unsigned32,

iscsiIntrAuthRowStatus RowStatus,

iscsiIntrAuthIdentity RowPointer,

iscsiIntrAuthStorageType StorageType

}

iscsiIntrAuthIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"An arbitrary integer used to uniquely identify a particular initiator node's authorized target identity within an iSCSI instance present on the local system. This index value must not be modified or reused by an agent unless a reboot has occurred. An agent should attempt to keep this value persistent across reboots."

::= { iscsiIntrAuthAttributesEntry 1 }

iscsiIntrAuthRowStatus OBJECT-TYPE

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"This field allows entries to be dynamically added and removed from this table via SNMP. When adding a row to this table, all non-Index/RowStatus objects must be set. When the value of this object is 'active', the values of the other objects in this table cannot be changed. Rows may be discarded using RowStatus."

::= { iscsiIntrAuthAttributesEntry 2 }

iscsiIntrAuthIdentity OBJECT-TYPE

SYNTAX RowPointer
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"A pointer to the corresponding user entry in the IPS-AUTH MIB module to which this initiator node should attempt to establish an iSCSI session."

REFERENCE

"IPS-AUTH MIB, RFC 4545, Section 7.3, ipsAuthIdentity"

::= { iscsiIntrAuthAttributesEntry 3 }

iscsiIntrAuthStorageType OBJECT-TYPE

SYNTAX StorageType
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"The storage type for this row. Rows in this table that were created through an external process (e.g., not created via this MIB) may have a storage type of readOnly or permanent.

Conceptual rows having the value 'permanent' need not


```

        allow write access to any columnar objects in the row."
    DEFVAL      { nonVolatile }
 ::= { iscsiIntrAuthAttributesEntry 4 }

--*****

iscsiSession OBJECT IDENTIFIER ::= { iscsiObjects 10 }

-- Session Attributes Table

iscsiSessionAttributesTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IscsiSessionAttributesEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "A list of sessions belonging to each iSCSI instance
        present on the system."
 ::= { iscsiSession 1 }

iscsiSessionAttributesEntry OBJECT-TYPE
    SYNTAX      IscsiSessionAttributesEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (row) containing management information applicable
        to a particular session.

        If this session is a discovery session that is not attached
        to any particular node, the iscsiSsnNodeIndex will be zero.
        Otherwise, the iscsiSsnNodeIndex will have the same value as
        iscsiNodeIndex."
    INDEX { iscsiInstIndex, iscsiSsnNodeIndex, iscsiSsnIndex }
 ::= { iscsiSessionAttributesTable 1 }

IscsiSessionAttributesEntry ::= SEQUENCE {
    iscsiSsnNodeIndex      Unsigned32,
    iscsiSsnIndex          Unsigned32,
    iscsiSsnDirection      INTEGER,
    iscsiSsnInitiatorName   IscsiName,
    iscsiSsnTargetName      IscsiName,
    iscsiSsnTSIH           Unsigned32,
    iscsiSsnISID           OCTET STRING,
    iscsiSsnInitiatorAlias   SnmpAdminString,
    iscsiSsnTargetAlias     SnmpAdminString,
    iscsiSsnInitialR2T      TruthValue,
    iscsiSsnImmediateData   TruthValue,
    iscsiSsnType            INTEGER,
    iscsiSsnMaxOutstandingR2T Unsigned32,

```

```

iscsiSsnFirstBurstLength      Unsigned32,
iscsiSsnMaxBurstLength        Unsigned32,
iscsiSsnConnectionNumber      Gauge32,
iscsiSsnAuthIdentity           RowPointer,
iscsiSsnDataSequenceInOrder    TruthValue,
iscsiSsnDataPDUInOrder         TruthValue,
iscsiSsnErrorRecoveryLevel     Unsigned32,
iscsiSsnDiscontinuityTime      TimeStamp,
iscsiSsnProtocolLevel          Unsigned32,
iscsiSsnTaskReporting          BITS
}

iscsiSsnNodeIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (0..4294967295)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer used to uniquely identify a
        particular node within an iSCSI instance present
        on the local system. For normal, non-discovery
        sessions, this value will map to the iscsiNodeIndex.
        For discovery sessions that do not have a node
        associated, the value 0 (zero) is used."
 ::= { iscsiSessionAttributesEntry 1 }

iscsiSsnIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer used to uniquely identify a
        particular session within an iSCSI instance present
        on the local system. An agent should attempt to
        not reuse index values unless a reboot has occurred.
        iSCSI sessions are destroyed during a reboot; rows
        in this table are not persistent across reboots."
 ::= { iscsiSessionAttributesEntry 2 }

iscsiSsnDirection OBJECT-TYPE
    SYNTAX      INTEGER {
                    inboundSession(1),
                    outboundSession(2)
                }
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "Direction of iSCSI session:
        inboundSession - session is established from an external

```

```

        initiator to a target within this iSCSI
        instance.
    outboundSession - session is established from an initiator
        within this iSCSI instance to an external
        target."
 ::= { iscsiSessionAttributesEntry 3 }

iscsiSsnInitiatorName OBJECT-TYPE
    SYNTAX      IscsiName
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "If iscsiSsnDirection is Inbound, this object is a
        UTF-8 string that will contain the name of the remote
        initiator.  If this session is a discovery session that
        does not specify a particular initiator, this object
        will contain a zero-length string.

        If iscsiSsnDirection is Outbound, this object will
        contain a zero-length string."
 ::= { iscsiSessionAttributesEntry 4 }

iscsiSsnTargetName OBJECT-TYPE
    SYNTAX      IscsiName
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "If iscsiSsnDirection is Outbound, this object is a
        UTF-8 string that will contain the name of the remote
        target.  If this session is a discovery session that
        does not specify a particular target, this object will
        contain a zero-length string.

        If iscsiSsnDirection is Inbound, this object will
        contain a zero-length string."
 ::= { iscsiSessionAttributesEntry 5 }

iscsiSsnTSIH OBJECT-TYPE
    SYNTAX      Unsigned32 (1..65535)
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The target-defined identification handle for this session."
    REFERENCE
        "RFC 7143, Section 11.12.6, TSIH"
 ::= { iscsiSessionAttributesEntry 6 }

iscsiSsnISID OBJECT-TYPE

```

SYNTAX OCTET STRING (SIZE(6))
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The initiator-defined portion of the iSCSI Session ID."

REFERENCE

"RFC 7143, Section 11.12.5, ISID"

::= { iscsiSessionAttributesEntry 7 }

iscsiSsnInitiatorAlias OBJECT-TYPE

SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"A UTF-8 string that gives the alias communicated by the initiator end of the session during the login phase."

If no alias exists, the value is a zero-length string."

REFERENCE

"RFC 7143, Section 13.7, InitiatorAlias"

::= { iscsiSessionAttributesEntry 8 }

iscsiSsnTargetAlias OBJECT-TYPE

SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"A UTF-8 string that gives the alias communicated by the target end of the session during the login phase."

If no alias exists, the value is a zero-length string."

REFERENCE

"RFC 7143, Section 13.6, TargetAlias"

::= { iscsiSessionAttributesEntry 9 }

iscsiSsnInitialR2T OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"If set to true, indicates that the initiator must wait for an R2T before sending to the target. If set to false, the initiator may send data immediately, within limits set by iscsiSsnFirstBurstLength and the expected data transfer length of the request."

REFERENCE

"RFC 7143, Section 13.10, InitialR2T"

::= { iscsiSessionAttributesEntry 10 }

iscsiSsnImmediateData OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Indicates whether the initiator and target have agreed to support immediate data on this session."

REFERENCE

"RFC 7143, Section 13.11, ImmediateData"

::= { iscsiSessionAttributesEntry 11 }**iscsiSsnType OBJECT-TYPE**SYNTAX INTEGER {
normalSession(1),
discoverySession(2)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Type of iSCSI session:

normalSession - session is a normal iSCSI session

discoverySession - session is being used only for discovery."

REFERENCE

"RFC 7143, Section 13.21, SessionType"

::= { iscsiSessionAttributesEntry 12 }**iscsiSsnMaxOutstandingR2T OBJECT-TYPE**

SYNTAX Unsigned32 (1..65535)

UNITS "R2Ts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum number of outstanding requests-to-transmit (R2Ts) per iSCSI task within this session."

REFERENCE

"RFC 7143, Section 13.17, MaxOutstandingR2T"

::= { iscsiSessionAttributesEntry 13 }**iscsiSsnFirstBurstLength OBJECT-TYPE**

SYNTAX Unsigned32 (512..16777215)

UNITS "bytes"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum length supported for unsolicited data sent within this session."

REFERENCE

```
"RFC 7143, Section 13.14, FirstBurstLength"
 ::= { iscsiSessionAttributesEntry 14 }

iscsiSsnMaxBurstLength OBJECT-TYPE
    SYNTAX      Unsigned32 (512..16777215)
    UNITS       "bytes"
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The maximum number of bytes that can be sent within
         a single sequence of Data-In or Data-Out PDUs."
    REFERENCE
        "RFC 7143, Section 13.13, MaxBurstLength"
 ::= { iscsiSessionAttributesEntry 15 }

iscsiSsnConnectionNumber OBJECT-TYPE
    SYNTAX      Gauge32 (1..65535)
    UNITS       "connections"
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The number of transport protocol connections that currently
         belong to this session."
 ::= { iscsiSessionAttributesEntry 16 }

iscsiSsnAuthIdentity OBJECT-TYPE
    SYNTAX      RowPointer
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "This object contains a pointer to a row in the
         IPS-AUTH MIB module that identifies the authentication
         identity being used on this session, as communicated
         during the login phase."
    REFERENCE
        "IPS-AUTH MIB, RFC 4545, Section 7.3, ipsAuthIdentity"
 ::= { iscsiSessionAttributesEntry 17 }

iscsiSsnDataSequenceInOrder OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "False indicates that iSCSI data PDU sequences may
         be transferred in any order. True indicates that
         data PDU sequences must be transferred using
         continuously increasing offsets, except during
         error recovery."
```

REFERENCE

"RFC 7143, Section 13.19, DataSequenceInOrder"

::= { iscsiSessionAttributesEntry 18 }

iscsiSsnDataPDUInOrder OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"False indicates that iSCSI data PDUs within sequences may be in any order. True indicates that data PDUs within sequences must be at continuously increasing addresses, with no gaps or overlay between PDUs. Default is true."

REFERENCE

"RFC 7143, Section 13.18, DataPDUInOrder"

::= { iscsiSessionAttributesEntry 19 }

iscsiSsnErrorRecoveryLevel OBJECT-TYPE

SYNTAX Unsigned32 (0..255)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The level of error recovery negotiated between the initiator and the target. Higher numbers represent more detailed recovery schemes."

REFERENCE

"RFC 7143, Section 13.20, ErrorRecoveryLevel"

::= { iscsiSessionAttributesEntry 20 }

iscsiSsnDiscontinuityTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of SysUpTime on the most recent occasion at which any one or more of this session's counters suffered a discontinuity.

When a session is established, and this object is created, it is initialized to the current value of SysUpTime."

::= { iscsiSessionAttributesEntry 21 }

iscsiSsnProtocolLevel OBJECT-TYPE

SYNTAX Unsigned32 (0..31)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

```

        "The iSCSI protocol level negotiated for this session."
REFERENCE
    "RFC 7144, Section 7.1.1, iSCSIProtocolLevel"
DEFVAL      { 1 }
 ::= { iscsiSessionAttributesEntry 22 }

iscsiSsnTaskReporting OBJECT-TYPE
    SYNTAX      BITS {
        taskReportingRfc3720(0),
        taskReportingResponseFence(1),
        taskReportingFastAbort(2)
    }

    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This key is used to negotiate the task completion reporting
        semantics from the SCSI target.

        Default value is taskReportingRfc3720."
REFERENCE
    "RFC 7143, Section 13.23, TaskReporting"
 ::= { iscsiSessionAttributesEntry 23 }

-- Session Stats Table

iscsiSessionStatsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IscsiSessionStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "A list of general iSCSI traffic counters for each of the
        sessions present on the system."
 ::= { iscsiSession 2 }

iscsiSessionStatsEntry OBJECT-TYPE
    SYNTAX      IscsiSessionStatsEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry (row) containing general iSCSI traffic counters
        for a particular session."
    AUGMENTS { iscsiSessionAttributesEntry }

 ::= { iscsiSessionStatsTable 1 }

IscsiSessionStatsEntry ::= SEQUENCE {
    iscsiSsnCmdPDUs          Counter32,

```



```

    iscsiSsnRspPDUs          Counter32,
    iscsiSsnTxDataOoctets    Counter64,
    iscsiSsnRxDataOoctets    Counter64,
    iscsiSsnLCTxDataOoctets  Counter32,
    iscsiSsnLCRxDataOoctets  Counter32,
    iscsiSsnNopReceivedPDUs  Counter32,
    iscsiSsnNopSentPDUs      Counter32
}

iscsiSsnCmdPDUs OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "PDUs"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The count of Command PDUs transferred on this session.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiSsnDiscontinuityTime."
 ::= { iscsiSessionStatsEntry 1 }

iscsiSsnRspPDUs OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "PDUs"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The count of Response PDUs transferred on this session.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiSsnDiscontinuityTime."
 ::= { iscsiSessionStatsEntry 2 }

iscsiSsnTxDataOoctets OBJECT-TYPE
    SYNTAX      Counter64
    UNITS        "octets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The count of data octets that were transmitted by
        the local iSCSI node on this session.
        If this counter has suffered a discontinuity, the time of the
        last discontinuity is indicated in iscsiSsnDiscontinuityTime."
 ::= { iscsiSessionStatsEntry 3 }

iscsiSsnRxDataOoctets OBJECT-TYPE
    SYNTAX      Counter64
    UNITS        "octets"
    MAX-ACCESS   read-only
    STATUS       current

```

DESCRIPTION

"The count of data octets that were received by the local iSCSI node on this session.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiSsnDiscontinuityTime."

::= { iscsiSessionStatsEntry 4 }

iscsiSsnLCTxDataOctets OBJECT-TYPE

SYNTAX Counter32

UNITS "octets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A Low-Capacity shadow object of iscsiSsnTxDataOctets for those systems that are accessible via SNMPv1 only.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiSsnDiscontinuityTime."

::= { iscsiSessionStatsEntry 5 }

iscsiSsnLCRxDataOctets OBJECT-TYPE

SYNTAX Counter32

UNITS "octets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A Low-Capacity shadow object of iscsiSsnRxDataOctets for those systems which are accessible via SNMPv1 only.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiSsnDiscontinuityTime."

::= { iscsiSessionStatsEntry 6 }

iscsiSsnNopReceivedPDUs OBJECT-TYPE

SYNTAX Counter32

UNITS "PDUs"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of NOP-In or NOP-Out PDUs received on this session.

If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiSsnDiscontinuityTime."

::= { iscsiSessionStatsEntry 7 }

iscsiSsnNopSentPDUs OBJECT-TYPE

SYNTAX Counter32

UNITS "PDUs"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The count of NOP-In or NOP-Out PDUs sent on this session.
 If this counter has suffered a discontinuity, the time of the
 last discontinuity is indicated in iscsiSsnDiscontinuityTime."
 ::= { iscsiSessionStatsEntry 8 }

-- Session Connection Error Stats Table

iscsiSessionCxnErrorStatsTable OBJECT-TYPE
 SYNTAX SEQUENCE OF IscsiSessionCxnErrorStatsEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "A list of error counters for each of the sessions
 present on this system."
 ::= { iscsiSession 3 }

iscsiSessionCxnErrorStatsEntry OBJECT-TYPE
 SYNTAX IscsiSessionCxnErrorStatsEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry (row) containing error counters for
 a particular session."
 AUGMENTS { iscsiSessionAttributesEntry }
 ::= { iscsiSessionCxnErrorStatsTable 1 }

IscsiSessionCxnErrorStatsEntry ::= SEQUENCE {
 iscsiSsnCxnDigestErrors Counter32,
 iscsiSsnCxnTimeoutErrors Counter32
 }

iscsiSsnCxnDigestErrors OBJECT-TYPE
 SYNTAX Counter32
 UNITS "PDUs"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The count of PDUs that were received on the session and
 contained header or data digest errors.
 If this counter has suffered a discontinuity, the time of the
 last discontinuity is indicated in iscsiSsnDiscontinuityTime.
 This counter is most likely provided when the error-recovery
 level is 1 or 2"
 REFERENCE
 "RFC 7143, Section 7.8, Digest Errors"
 ::= { iscsiSessionCxnErrorStatsEntry 1 }

iscsiSsnCxnTimeoutErrors OBJECT-TYPE

SYNTAX Counter32
 UNITS "connections"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The count of connections within this session that have been terminated due to timeout. If this counter has suffered a discontinuity, the time of the last discontinuity is indicated in iscsiSsnDiscontinuityTime. This counter is most likely provided when the error-recovery level is 2"

REFERENCE

"RFC 7143, Section 7.5, Connection Timeout Management"

::= { iscsiSessionCxnErrorStatsEntry 2 }

--*****

iscsiConnection OBJECT IDENTIFIER ::= { iscsiObjects 11 }

-- Connection Attributes Table

iscsiConnectionAttributesTable OBJECT-TYPE

SYNTAX SEQUENCE OF IscsiConnectionAttributesEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"A list of connections belonging to each iSCSI instance present on the system."

::= { iscsiConnection 1 }

iscsiConnectionAttributesEntry OBJECT-TYPE

SYNTAX IscsiConnectionAttributesEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry (row) containing management information applicable to a particular connection."

INDEX { iscsiInstIndex, iscsiSsnNodeIndex, iscsiSsnIndex, iscsiCxnIndex }

::= { iscsiConnectionAttributesTable 1 }

IscsiConnectionAttributesEntry ::= SEQUENCE {

iscsiCxnIndex Unsigned32,
 iscsiCxnCid Unsigned32,
 iscsiCxnState INTEGER,
 iscsiCxnAddrType InetAddressType,
 iscsiCxnLocalAddr InetAddress,
 iscsiCxnProtocol IscsiTransportProtocol,

```

iscsiCxnLocalPort          InetPortNumber,
iscsiCxnRemoteAddr         InetAddress,
iscsiCxnRemotePort         InetPortNumber,
iscsiCxnMaxRecvDataSegLength Unsigned32,
iscsiCxnMaxXmitDataSegLength Unsigned32,
iscsiCxnHeaderIntegrity    IscsiDigestMethod,
iscsiCxnDataIntegrity      IscsiDigestMethod,
iscsiCxnRecvMarker         TruthValue,
iscsiCxnSendMarker         TruthValue,
iscsiCxnVersionActive      Unsigned32
}

iscsiCxnIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An arbitrary integer used to uniquely identify a
        particular connection of a particular session within
        an iSCSI instance present on the local system.  An
        agent should attempt to not reuse index values unless
        a reboot has occurred.  iSCSI connections are destroyed
        during a reboot; rows in this table are not persistent
        across reboots."
    ::= { iscsiConnectionAttributesEntry 1 }

iscsiCxnCid OBJECT-TYPE
    SYNTAX      Unsigned32 (1..65535)
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The iSCSI Connection ID for this connection."
    ::= { iscsiConnectionAttributesEntry 2 }

iscsiCxnState OBJECT-TYPE
    SYNTAX      INTEGER {
                    login(1),
                    full(2),
                    logout(3)
                }
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The current state of this connection, from an iSCSI negotiation
        point of view.  Here are the states:

        login - The transport protocol connection has been established,
                 but a valid iSCSI login response with the final bit set

```

has not been sent or received.
 full - A valid iSCSI login response with the final bit set has been sent or received.
 logout - A valid iSCSI logout command has been sent or received, but the transport protocol connection has not yet been closed."

::= { iscsiConnectionAttributesEntry 3 }

iscsiCxnAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of Internet Network Addresses contained in the corresponding instances of iscsiCxnLocalAddr and iscsiCxnRemoteAddr.

The value 'dns' is not allowed."

::= { iscsiConnectionAttributesEntry 4 }

iscsiCxnLocalAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The local Internet Network Address, of the type specified by iscsiCxnAddrType, used by this connection."

::= { iscsiConnectionAttributesEntry 5 }

iscsiCxnProtocol OBJECT-TYPE

SYNTAX IscsiTransportProtocol

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The transport protocol over which this connection is running."

::= { iscsiConnectionAttributesEntry 6 }

iscsiCxnLocalPort OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The local transport protocol port used by this connection. This object cannot have the value zero, since it represents an established connection."

::= { iscsiConnectionAttributesEntry 7 }

iscsiCxnRemoteAddr OBJECT-TYPE

SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The remote Internet Network Address, of the type specified
 by iscsiCxnAddrType, used by this connection."
 ::= { iscsiConnectionAttributesEntry 8 }

iscsiCxnRemotePort OBJECT-TYPE
SYNTAX InetPortNumber
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The remote transport protocol port used by this connection.
 This object cannot have the value zero, since it represents
 an established connection."
 ::= { iscsiConnectionAttributesEntry 9 }

iscsiCxnMaxRecvDataSegLength OBJECT-TYPE
SYNTAX Unsigned32 (512..16777215)
UNITS "bytes"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The maximum data payload size supported for command
 or data PDUs able to be received on this connection."
REFERENCE
 "RFC 7143, Section 13.12, MaxRecvDataSegmentLength"
 ::= { iscsiConnectionAttributesEntry 10 }

iscsiCxnMaxXmitDataSegLength OBJECT-TYPE
SYNTAX Unsigned32 (512..16777215)
UNITS "bytes"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The maximum data payload size supported for command
 or data PDUs to be sent on this connection."
REFERENCE
 "RFC 7143, Section 13.12, MaxRecvDataSegmentLength"
 ::= { iscsiConnectionAttributesEntry 11 }

iscsiCxnHeaderIntegrity OBJECT-TYPE
SYNTAX IscsiDigestMethod
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object identifies the iSCSI header

digest scheme in use within this connection."
 ::= { iscsiConnectionAttributesEntry 12 }

iscsiCxnDataIntegrity OBJECT-TYPE
 SYNTAX IscsiDigestMethod
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "This object identifies the iSCSI data
 digest scheme in use within this connection."
 ::= { iscsiConnectionAttributesEntry 13 }

iscsiCxnRecvMarker OBJECT-TYPE
 SYNTAX TruthValue
 MAX-ACCESS read-only
 STATUS deprecated
 DESCRIPTION
 "This object indicates whether or not this connection
 is receiving markers in its incoming data stream."
 REFERENCE
 "RFC 7143, Section 13.25, Obsoleted Keys."
 ::= { iscsiConnectionAttributesEntry 14 }

iscsiCxnSendMarker OBJECT-TYPE
 SYNTAX TruthValue
 MAX-ACCESS read-only
 STATUS deprecated
 DESCRIPTION
 "This object indicates whether or not this connection
 is inserting markers in its outgoing data stream."
 REFERENCE
 "RFC 7143, Section 13.25, Obsoleted Keys."
 ::= { iscsiConnectionAttributesEntry 15 }

iscsiCxnVersionActive OBJECT-TYPE
 SYNTAX Unsigned32 (0..255)
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "Active version number of the iSCSI specification negotiated
 on this connection."
 REFERENCE
 "RFC 7143, Section 11.12, Login Request"
 ::= { iscsiConnectionAttributesEntry 16 }

--*****
-- Notifications

iscsiTgtLoginFailure NOTIFICATION-TYPE

```
OBJECTS {  
    iscsiTgtLoginFailures,  
    iscsiTgtLastFailureType,  
    iscsiTgtLastIntrFailureName,  
    iscsiTgtLastIntrFailureAddrType,  
    iscsiTgtLastIntrFailureAddr,  
    iscsiTgtLastIntrFailurePort  
}
```

STATUS current

DESCRIPTION

"Sent when a login is failed by a target.

To avoid sending an excessive number of notifications due to multiple errors counted, an SNMP agent implementing this notification SHOULD NOT send more than 3 notifications of this type in any 10-second time period."

::= { iscsiNotifications 1 }

iscsiIntrLoginFailure NOTIFICATION-TYPE

```
OBJECTS {  
    iscsiIntrLoginFailures,  
    iscsiIntrLastFailureType,  
    iscsiIntrLastTgtFailureName,  
    iscsiIntrLastTgtFailureAddrType,  
    iscsiIntrLastTgtFailureAddr,  
    iscsiIntrLastTgtFailurePort  
}
```

STATUS current

DESCRIPTION

"Sent when a login is failed by an initiator.

To avoid sending an excessive number of notifications due to multiple errors counted, an SNMP agent implementing this notification SHOULD NOT send more than 3 notifications of this type in any 10-second time period."

::= { iscsiNotifications 2 }

iscsiInstSessionFailure NOTIFICATION-TYPE

```
OBJECTS {  
    iscsiInstSsnFailures,  
    iscsiInstLastSsnFailureType,  
    iscsiInstLastSsnRmtNodeName  
}
```

STATUS current

DESCRIPTION

"Sent when an active session is failed by either the initiator or the target.

To avoid sending an excessive number of notifications due to multiple errors counted, an SNMP agent implementing this notification SHOULD NOT send more than 3 notifications of this type in any 10-second time period."

```
::= { iscsiNotifications 3 }
```

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

-- Conformance Statements

```
iscsiCompliances OBJECT IDENTIFIER ::= { iscsiConformance 1 }
iscsiGroups       OBJECT IDENTIFIER ::= { iscsiConformance 2 }
```

```
iscsiInstanceAttributesGroup OBJECT-GROUP
```

```
  OBJECTS {
    iscsiInstDescr,
    iscsiInstVersionMin,
    iscsiInstVersionMax,
    iscsiInstVendorID,
    iscsiInstVendorVersion,
    iscsiInstPortalNumber,
    iscsiInstNodeNumber,
    iscsiInstSessionNumber,
    iscsiInstSsnFailures,
    iscsiInstLastSsnFailureType,
    iscsiInstLastSsnRmtNodeName,
    iscsiInstDiscontinuityTime,
    iscsiInstXNodeArchitecture
  }
```

```
  STATUS current
```

```
  DESCRIPTION
```

```
    "A collection of objects providing information about iSCSI
    instances."
```

```
::= { iscsiGroups 1 }
```

```
iscsiInstanceSsnErrorStatsGroup OBJECT-GROUP
```

```
  OBJECTS {
    iscsiInstSsnDigestErrors,
    iscsiInstSsnCxnTimeoutErrors,
    iscsiInstSsnFormatErrors
  }
```

```
  STATUS current
```

```
  DESCRIPTION
```

```
    "A collection of objects providing information about
    errors that have caused a session failure for an
    iSCSI instance."
```

```
::= { iscsiGroups 2 }
```

iscsiPortalAttributesGroup OBJECT-GROUP

```
OBJECTS {  
    iscsiPortalRowStatus,  
    iscsiPortalStorageType,  
    iscsiPortalRoles,  
    iscsiPortalAddrType,  
    iscsiPortalAddr,  
    iscsiPortalProtocol,  
    iscsiPortalMaxRecvDataSegLength,  
    iscsiPortalPrimaryHdrDigest,  
    iscsiPortalPrimaryDataDigest,  
    iscsiPortalSecondaryHdrDigest,  
    iscsiPortalSecondaryDataDigest,  
    iscsiPortalRecvMarker  
}
```

STATUS deprecated

DESCRIPTION

"A collection of objects providing information about the transport protocol endpoints of the local targets. This object group is deprecated because the marker key is obsolete."

REFERENCE

"RFC 7143, Section 13.25, Obsoleted Keys."

::= { iscsiGroups 3 }

iscsiTgtPortalAttributesGroup OBJECT-GROUP

```
OBJECTS {  
    iscsiTgtPortalPort,  
    iscsiTgtPortalTag  
}
```

STATUS current

DESCRIPTION

"A collection of objects providing information about the transport protocol endpoints of the local targets."

::= { iscsiGroups 4 }

iscsiIntrPortalAttributesGroup OBJECT-GROUP

```
OBJECTS {  
    iscsiIntrPortalTag  
}
```

STATUS current

DESCRIPTION

"An object providing information about the portal tags used by the local initiators."

::= { iscsiGroups 5 }

iscsiNodeAttributesGroup OBJECT-GROUP

```
OBJECTS {
```

```

        iscsiNodeName,
        iscsiNodeAlias,
        iscsiNodeRoles,
        iscsiNodeTransportType,
        iscsiNodeInitialR2T,
        iscsiNodeImmediateData,
        iscsiNodeMaxOutstandingR2T,
        iscsiNodeFirstBurstLength,
        iscsiNodeMaxBurstLength,
        iscsiNodeMaxConnections,
        iscsiNodeDataSequenceInOrder,
        iscsiNodeDataPDUInOrder,
        iscsiNodeDefaultTime2Wait,
        iscsiNodeDefaultTime2Retain,
        iscsiNodeErrorRecoveryLevel,
        iscsiNodeDiscontinuityTime,
        iscsiNodeStorageType
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        local targets."
 ::= { iscsiGroups 6 }

iscsiTargetAttributesGroup OBJECT-GROUP
    OBJECTS {
        iscsiTgtLoginFailures,
        iscsiTgtLastFailureTime,
        iscsiTgtLastFailureType,
        iscsiTgtLastIntrFailureName,
        iscsiTgtLastIntrFailureAddrType,
        iscsiTgtLastIntrFailureAddr
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        local targets."
 ::= { iscsiGroups 7 }

iscsiTargetLoginStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiTgtLoginAccepts,
        iscsiTgtLoginOtherFails,
        iscsiTgtLoginRedirects,
        iscsiTgtLoginAuthorizeFails,
        iscsiTgtLoginAuthenticateFails,
        iscsiTgtLoginNegotiateFails
    }

```

```
STATUS current
DESCRIPTION
    "A collection of objects providing information about all
    login attempts by remote initiators to local targets."
::= { iscsiGroups 8 }

iscsiTargetLogoutStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiTgtLogoutNormals,
        iscsiTgtLogoutOthers
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        logout events between remote initiators and local targets."
    ::= { iscsiGroups 9 }

iscsiTargetAuthGroup OBJECT-GROUP
    OBJECTS {
        iscsiTgtAuthRowStatus,
        iscsiTgtAuthStorageType,
        iscsiTgtAuthIdentity
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        remote initiators that are authorized to connect to local
        targets."
    ::= { iscsiGroups 10 }

iscsiInitiatorAttributesGroup OBJECT-GROUP
    OBJECTS {
        iscsiIntrLoginFailures,
        iscsiIntrLastFailureTime,
        iscsiIntrLastFailureType,
        iscsiIntrLastTgtFailureName,
        iscsiIntrLastTgtFailureAddrType,
        iscsiIntrLastTgtFailureAddr
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about
        all local initiators."
    ::= { iscsiGroups 11 }

iscsiInitiatorLoginStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiIntrLoginAcceptRsps,
```

```
        iscsiIntrLoginOtherFailRsps,
        iscsiIntrLoginRedirectRsps,
        iscsiIntrLoginAuthFailRsps,
        iscsiIntrLoginAuthenticateFails,
        iscsiIntrLoginNegotiateFails,
        iscsiIntrLoginAuthorizeFails
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        login attempts by local initiators to remote targets."
 ::= { iscsiGroups 12 }

iscsiInitiatorLogoutStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiIntrLogoutNormals,
        iscsiIntrLogoutOthers
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        logout events between local initiators and remote targets."
 ::= { iscsiGroups 13 }

iscsiInitiatorAuthGroup OBJECT-GROUP
    OBJECTS {
        iscsiIntrAuthRowStatus,
        iscsiIntrAuthStorageType,
        iscsiIntrAuthIdentity
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about all
        remote targets that are initiators of the local system
        that they are authorized to access."
 ::= { iscsiGroups 14 }

iscsiSessionAttributesGroup OBJECT-GROUP
    OBJECTS {
        iscsiSsnDirection,
        iscsiSsnInitiatorName,
        iscsiSsnTargetName,
        iscsiSsnTSIH,
        iscsiSsnISID,
        iscsiSsnInitiatorAlias,
        iscsiSsnTargetAlias,
        iscsiSsnInitialR2T,
        iscsiSsnImmediateData,
```

```
        iscsiSsnType,
        iscsiSsnMaxOutstandingR2T,
        iscsiSsnFirstBurstLength,
        iscsiSsnMaxBurstLength,
        iscsiSsnConnectionNumber,
        iscsiSsnAuthIdentity,
        iscsiSsnDataSequenceInOrder,
        iscsiSsnDataPDUInOrder,
        iscsiSsnErrorRecoveryLevel,
        iscsiSsnDiscontinuityTime,
        iscsiSsnProtocolLevel,
        iscsiSsnTaskReporting
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information applicable to
        all sessions."
 ::= { iscsiGroups 15 }

iscsiSessionPDUStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiSsnCmdPDUs,
        iscsiSsnRspPDUs
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about PDU
        traffic for each session."
 ::= { iscsiGroups 16 }

iscsiSessionOctetStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiSsnTxDataOctets,
        iscsiSsnRxDataOctets
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about octet
        traffic for each session using a Counter64 data type."
 ::= { iscsiGroups 17 }

iscsiSessionLCOctetStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiSsnLCTxDataOctets,
        iscsiSsnLCRxDataOctets
    }
    STATUS current
    DESCRIPTION
```

```
    "A collection of objects providing information about octet
    traffic for each session using a Counter32 data type."
 ::= { iscsiGroups 18 }

iscsiSessionCxnErrorStatsGroup OBJECT-GROUP
    OBJECTS {
        iscsiSsnCxnDigestErrors,
        iscsiSsnCxnTimeoutErrors
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about connection
        errors for all sessions."
 ::= { iscsiGroups 19 }

iscsiConnectionAttributesGroup OBJECT-GROUP
    OBJECTS {
        iscsiCxnCid,
        iscsiCxnState,
        iscsiCxnProtocol,
        iscsiCxnAddrType,
        iscsiCxnLocalAddr,
        iscsiCxnLocalPort,
        iscsiCxnRemoteAddr,
        iscsiCxnRemotePort,
        iscsiCxnMaxRecvDataSegLength,
        iscsiCxnMaxXmitDataSegLength,
        iscsiCxnHeaderIntegrity,
        iscsiCxnDataIntegrity,
        iscsiCxnRecvMarker,
        iscsiCxnSendMarker,
        iscsiCxnVersionActive
    }
    STATUS deprecated
    DESCRIPTION
        "A collection of objects providing information about all
        connections used by all sessions.
        This object group is deprecated because the marker key
        is obsolete."
    REFERENCE
        "RFC 7143, Section 13.25, Obsoleted Keys."
 ::= { iscsiGroups 20 }

iscsiTgtLgnNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        iscsiTgtLoginFailure
    }
    STATUS current
```



```
DESCRIPTION
    "A collection of notifications that indicate a login
    failure from a remote initiator to a local target."
 ::= { iscsiGroups 21 }

iscsiIntrLgnNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        iscsiIntrLoginFailure
    }
    STATUS current
    DESCRIPTION
        "A collection of notifications that indicate a login
        failure from a local initiator to a remote target."
 ::= { iscsiGroups 22 }

iscsiSsnFlrNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        iscsiInstSessionFailure
    }
    STATUS current
    DESCRIPTION
        "A collection of notifications that indicate session
        failures occurring after login."
 ::= { iscsiGroups 23 }

iscsiPortalAttributesGroupV2 OBJECT-GROUP
    OBJECTS {
        iscsiPortalRowStatus,
        iscsiPortalStorageType,
        iscsiPortalRoles,
        iscsiPortalAddrType,
        iscsiPortalAddr,
        iscsiPortalProtocol,
        iscsiPortalMaxRecvDataSegLength,
        iscsiPortalPrimaryHdrDigest,
        iscsiPortalPrimaryDataDigest,
        iscsiPortalSecondaryHdrDigest,
        iscsiPortalSecondaryDataDigest
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information about
        the transport protocol endpoints of the local targets."
 ::= { iscsiGroups 24 }

iscsiConnectionAttributesGroupV2 OBJECT-GROUP
    OBJECTS {
        iscsiCxnCid,
```

```

iscsiCxnState,
iscsiCxnProtocol,
iscsiCxnAddrType,
iscsiCxnLocalAddr,
iscsiCxnLocalPort,
iscsiCxnRemoteAddr,
iscsiCxnRemotePort,
iscsiCxnMaxRecvDataSegLength,
iscsiCxnMaxXmitDataSegLength,
iscsiCxnHeaderIntegrity,
iscsiCxnDataIntegrity,
iscsiCxnVersionActive

```

```

}

```

```

STATUS current

```

```

DESCRIPTION

```

```

    "A collection of objects providing information about all
    connections used by all sessions."

```

```

 ::= { iscsiGroups 25 }

```

```

iscsiNewObjectsV2 OBJECT-GROUP

```

```

OBJECTS {

```

```

    iscsiInstXNodeArchitecture,
    iscsiSsnTaskReporting,
    iscsiSsnProtocolLevel,
    iscsiSsnNopReceivedPDUs,
    iscsiSsnNopSentPDUs,
    iscsiIntrLastTgtFailurePort,
    iscsiTgtLastIntrFailurePort,
    iscsiPortalDescr,
    iscsiInstSsnTgtUnmappedErrors,
    iscsiTgtLogoutCxnClosed,
    iscsiTgtLogoutCxnRemoved

```

```

}

```

```

STATUS current

```

```

DESCRIPTION

```

```

    "A collection of objects added in the second version of the
    iSCSI MIB."

```

```

 ::= { iscsiGroups 26 }

```

```

--*****

```

```

iscsiComplianceV1 MODULE-COMPLIANCE

```

```

STATUS deprecated

```

```

DESCRIPTION

```

```

    "Initial version of compliance statement.

```

If an implementation can be both a target and an initiator, all groups are mandatory.
This module compliance is deprecated because the marker keys are obsolete."

REFERENCE

"RFC 7143, Section 13.25, Obsoleted Keys."

MODULE -- this module

MANDATORY-GROUPS {
iscsiInstanceAttributesGroup,
iscsiInstanceSsnErrorStatsGroup,
iscsiPortalAttributesGroup,
iscsiNodeAttributesGroup,
iscsiSessionAttributesGroup,
iscsiSessionPDUStatsGroup,
iscsiSessionCxnErrorStatsGroup,
iscsiConnectionAttributesGroup,
iscsiSsnFlrNotificationsGroup
}

-- Conditionally mandatory groups depending on the ability
-- to support Counter64 data types and/or to provide counter
-- information to SNMPv1 applications.

GROUP iscsiSessionOctetStatsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations
that can support Counter64 data types."

GROUP iscsiSessionLCOctetStatsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations
that provide information to SNMPv1-only applications;
this includes agents that cannot support Counter64
data types."

-- Conditionally mandatory groups to be included with
-- the mandatory groups when the implementation has
-- iSCSI target facilities.

GROUP iscsiTgtPortalAttributesGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations
that have iSCSI target facilities."

OBJECT iscsiPortalMaxRecvDataSegLength

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT iscsiNodeStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required; an implementation may choose to allow this object to be set to 'volatile' or 'nonVolatile'."

GROUP iscsiTargetAttributesGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTargetLoginStatsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTargetLogoutStatsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTgtLgnNotificationsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTargetAuthGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

-- Conditionally mandatory groups to be included with
-- the mandatory groups when the implementation has
-- iSCSI initiator facilities.

GROUP iscsiIntrPortalAttributesGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorAttributesGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorLoginStatsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations

that have iSCSI initiator facilities."

GROUP iscsiInitiatorLogoutStatsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiIntrLgnNotificationsGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorAuthGroup

DESCRIPTION

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

OBJECT iscsiNodeErrorRecoveryLevel

SYNTAX Unsigned32 (0..2)

DESCRIPTION

"Only values 0-2 are defined at present."

::= { iscsiCompliances 1 }

iscsiComplianceV2 MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"Version 2 of compliance statement based on this revised version of the MIB module.

If an implementation can be both a target and an initiator, all groups are mandatory."

MODULE -- this module

MANDATORY-GROUPS {

iscsiInstanceAttributesGroup,
iscsiInstanceSsnErrorStatsGroup,
iscsiPortalAttributesGroupV2,
iscsiNodeAttributesGroup,
iscsiSessionAttributesGroup,
iscsiSessionPDUStatsGroup,
iscsiSessionCxnErrorStatsGroup,
iscsiConnectionAttributesGroupV2,
iscsiSsnFlrNotificationsGroup

}

-- Conditionally mandatory groups depending on the ability
-- to support Counter64 data types and/or to provide counter
-- information to SNMPv1 applications.

GROUP iscsiSessionOctetStatsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that can support Counter64 data types."

GROUP iscsiSessionLCOctetStatsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that provide information to SNMPv1-only applications; this includes agents that cannot support Counter64 data types."

-- Conditionally mandatory groups to be included with
-- the mandatory groups when the implementation has
-- iSCSI target facilities.

GROUP iscsiTgtPortalAttributesGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

OBJECT iscsiPortalMaxRecvDataSegLength

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required."

OBJECT iscsiNodeStorageType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required; an implementation may choose to allow this object to be set to 'volatile' or 'nonVolatile'."

GROUP iscsiTargetAttributesGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTargetLoginStatsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTargetLogoutStatsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTgtLgnNotificationsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

GROUP iscsiTargetAuthGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI target facilities."

-- Conditionally mandatory groups to be included with
-- the mandatory groups when the implementation has
-- iSCSI initiator facilities.

GROUP iscsiIntrPortalAttributesGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorAttributesGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorLoginStatsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorLogoutStatsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiIntrLgnNotificationsGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

GROUP iscsiInitiatorAuthGroup**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that have iSCSI initiator facilities."

OBJECT iscsiNodeErrorRecoveryLevel

SYNTAX Unsigned32 (0..2)

DESCRIPTION

"Only values 0-2 are defined at present."

GROUP iscsiNewObjectsV2**DESCRIPTION**

"This group is mandatory for all iSCSI implementations that support a value of the iSCSIProtocolLevel key of 2 or greater."

::= { iscsiCompliances 2 }

END

8. Security Considerations

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

iscsiPortalAttributesTable, iscsiTgtPortalAttributesTable, and iscsiIntrPortalAttributesTable can be used to add or remove IP addresses to be used by iSCSI.

iscsiTgtAuthAttributesTable entries can be added or removed, to allow or disallow access to a target by an initiator.

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:

iscsiNodeAttributesTable, iscsiTargetAttributesTable, and iscsiTgtAuthorization can be used to glean information needed to make connections to the iSCSI targets this module represents. However, it is the responsibility of the initiators and targets involved to authenticate each other to ensure that an inappropriately advertised or discovered initiator or target does not compromise their security. These issues are discussed in [RFC7143].

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.

Implementations SHOULD provide the security features described by the SNMPv3 framework (see [RFC3410]), and implementations claiming compliance to the SNMPv3 standard MUST include full support for authentication and privacy via the User-based Security Model (USM) [RFC3414] with the AES cipher algorithm [RFC3826]. Implementations MAY also provide support for the Transport Security Model (TSM) [RFC5591] in combination with a secure transport such as SSH [RFC5592] or TLS/DTLS [RFC6353].

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.

9. IANA Considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER value recorded in the "SMI Network Management MGMT Codes Internet-standard MIB" registry:

Descriptor	OBJECT IDENTIFIER value
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iscsiMibModule	{ mib-2 142 }

IANA has updated the reference for the mib-2 142 identifier to refer to this document.

10. References

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