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**Definitions of Managed Objects for Internet Small Computer System
Interface (iSCSI)
[draft-ietf-storm-iscsimib-02.txt](#)**

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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 [RFC4544](#).

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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](#)].

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](#)].

[2. Introduction](#)

-- RFC Editor:replace cccc in RFCcccc at all the places in which it is used in this document, with the RFC number assigned to
-- [draft-ietf-storm-iscsi-cons-03](#) & remove this note.

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

[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 makes use of the IP Storage (IPS) Identity Authentication MIB module [[RFC4545](#)]. Here is how these modules are related:

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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 Auth MIB module to which the initiator should attempt to establish sessions. The 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.

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5. Differences from [RFC 4544](#)

[RFCcccc] updates several RFCs, including [[RFC3720](#)]. This document updates the iSCSI MIB correspondingly. The document uses iSCSIProtocolLevel as defined in [[RFCssss](#)]. 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
- . Changed the conformance statements to match the above
- . Fixed the errata to [[RFC4544](#)]

6. Discussion

This MIB module structure supplies configuration, fault, and statistics information for iSCSI devices [RFCcccc]. 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
```

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```

    -- 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 (outside
    -- initiator to our target) or Outbound (our initiator 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

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```

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, whenever a row is created or destroyed in the `iscsiPortalAttributesTable`, or if 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.

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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 [[RFCcccc](#)]. 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 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 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 within this instance sharing 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 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

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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.

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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

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sessions known to be existing 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.

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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.

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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 "201207100000Z" -- July 10, 2012  
ORGANIZATION "IETF STORage Maintenance (STORM) Working Group"  
CONTACT-INFO "  
Working Group Email : storm@ietf.org  
Attn: Mark Bakke  
Cisco Systems, Inc  
Email: mbakke@cisco.com
```

```
Prakash Venkatesen  
HCL Technologies  
Email: prakashvn@hcl.com"
```

```
DESCRIPTION
```

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

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REVISION "201207100000Z"

DESCRIPTION

"Second version of the iSCSI Protocol MIB Module.
[[RFCcccc](#)] makes several updates to [[RFC3720](#)]. This version makes corresponding updates to the MIB module.
This MIB module published as RFC xxxx."

-- RFC Editor: replace xxxx with actual RFC number & remove this note.

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 }

-- RFC Editor: replace cccc in RFC cccc at all the places in which it is used in this document, with the RFC number assigned to
-- [draft-ietf-storm-iscsi-cons-03](#) & remove this note.

-- 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

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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 the RFCcccc)).
CRC32c	- require a CRC32C digest."

REFERENCE

"RFC cccc, [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 cccc [section 4.2.7.1](#), and encoded as specified in RFC cccc [section 4.2.7.2](#). A zero-length string indicates the absence of an iSCSI name."

REFERENCE

"RFC cccc, [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 cccc, [Section 13.1](#), HeaderDigest and DataDigest"

::= { iscsiHeaderIntegrityTypes 1 }

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```
iscsiHdrIntegrityCrc32c OBJECT-IDENTITY
    STATUS      current
    DESCRIPTION
        "The authoritative identifier when the integrity
         scheme for the header is CRC32c."
    REFERENCE
        "RFC cccc, 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 cccc, 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 cccc, 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
```

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```
    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

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```
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 cccc, 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 cccc, 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, and is for informational purposes only.
It is unrelated to the iSCSI specification version numbers."
 ::= { iscsiInstanceAttributesEntry 6 }

iscsiInstPortalNumber OBJECT-TYPE
SYNTAX      Unsigned32
```

UNITS "transport endpoints"

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```
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 cccc, 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.
```

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```
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, and is for informational purposes only.
        It is unrelated to the iSCSI specification version numbers."
    REFERENCE
        "[RFCcccc], Section 13.26, X#NodeArchitecture"
 ::= { iscsiInstanceAttributesEntry 14 }

-- Instance Session Failure Stats Table

iscsiInstanceSsnErrorStatsTable OBJECT-TYPE
```

SYNTAX

SEQUENCE OF IscsiInstanceSsnErrorStatsEntry

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```
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
}

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 cccc, 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
```



```
 ::= { 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 cccc, Section 7.7, Format Errors"
 ::= { iscsiInstanceSsnErrorStatsEntry 3 }

--*****  
  
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,

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```

iscsiPortalProtocol          IscsiTransportProtocol,
iscsiPortalMaxRecvDataSegLength Unsigned32,
iscsiPortalPrimaryHdrDigest  IscsiDigestMethod,
iscsiPortalPrimaryDataDigest IscsiDigestMethod,
iscsiPortalSecondaryHdrDigest IscsiDigestMethod,
iscsiPortalSecondaryDataDigest IscsiDigestMethod,
iscsiPortalRecvMarker        TruthValue,
iscsiPortalStorageType       StorageType
}

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
     iscsiTgtPortalAttributesTable and/or
     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:

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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

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```
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 cccc, 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 }
```

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```
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
    "[RFCcccc], 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 }

--*****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

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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 }

IscsiTgtPortalAttributesEntry ::= 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

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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 cccc, [Section 4.4.1](#), iSCSI Architectural 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

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"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 cccc, [Section 4.4.1](#), iSCSI Architectural 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

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```
    applicable to a particular iSCSI node."
INDEX { iscsiInstIndex, iscsiNodeIndex }
 ::= { iscsiNodeAttributesTable 1 }

IscsiNodeAttributesEntry ::= SEQUENCE {
  iscsiNodeIndex          Unsigned32,
  iscsinodeName            IscsiName,
  iscsiNodeAlias           SnmpAdminString,
  iscsiNodeRoles           BITS,
  iscsiNodeTransportType   RowPointer,
  iscsiNodeInitialR2T      TruthValue,
  iscsiNodeImmediateData   TruthValue,
  iscsiNodeMaxOutstandingR2T Unsigned32,
  iscsiNodeFirstBurstLength Unsigned32,
  iscsiNodeMaxBurstLength  Unsigned32,
  iscsiNodeMaxConnections  Unsigned32,
  iscsiNodeDataSequenceInOrder TruthValue,
  iscsiNodeDataPDUInOrder   TruthValue,
  iscsiNodeDefaultTime2Wait Unsigned32,
  iscsiNodeDefaultTime2Retain 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`

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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 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 cccc, [Section 13.6](#), TargetAlias, 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](#), 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 cccc, [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 cccc, [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 cccc, [Section 13.17](#), MaxOutstandingR2T"

DEFVAL { 1 }

::= { iscsiNodeAttributesEntry 8 }

iscsiNodeFirstBurstLength OBJECT-TYPE

SYNTAX

Unsigned32 (512..16777215)

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```
UNITS          "bytes"
MAX-ACCESS    read-write
STATUS         current
DESCRIPTION
  "The maximum length (bytes) supported for unsolicited data
  to/from this node."
REFERENCE
  "RFC cccc, 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 cccc, 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 cccc, 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

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```
"RFC cccc, Section 13.19, DataSequenceInOrder"
DEFVAL      { true }
 ::= { iscsiNodeAttributesEntry 12 }

iscsiNodeDataPDUInOrder OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "The DataPDUInOrder 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 cccc, 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 cccc, 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 cccc, Section 13.16, DefaultTime2Retain"
```

DEFVAL { 20 }

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```
::= { 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 cccc, 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
 }

iscsiTgtLoginFailures OBJECT-TYPE
 SYNTAX Counter32
 UNITS "failed login attempts"

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```
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 cccc, 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

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```
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 }

-- 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
```

}

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```
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 cccc, 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 cccc, 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 cccc, Section 11.13.5, Status-Class and Status-Detail"
 ::= { iscsiTargetLoginStatsEntry 3 }

iscsiTgtLoginAuthorizeFails OBJECT-TYPE
  SYNTAX      Counter32
  UNITS      "failed logins"
```

MAX-ACCESS read-only

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```
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 cccc, 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 cccc, 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

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```
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
    PDUs that were received by this target."
  AUGMENTS { iscsiTargetAttributesEntry }
 ::= { iscsiTargetLogoutStatsTable 1 }

IscsiTargetLogoutStatsEntry ::= SEQUENCE {
  iscsiTgtLogoutNormals          Counter32,
  iscsiTgtLogoutOthers           Counter32
}

iscsiTgtLogoutNormals OBJECT-TYPE
  SYNTAX        Counter32
  UNITS         "normal logouts"
  MAX-ACCESS   read-only
  STATUS        current
  DESCRIPTION
    "The count of Logout Command PDUs 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 cccc, 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

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```
"RFC cccc, Section 11.14.1, Reason Code"
 ::= { iscsiTargetLogoutStatsEntry 2 }

-- ****
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 }
```

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```

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, 7.3, ipsAuthIdentAttributeEntry"
 ::= { 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

```

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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,
 iscsiIntrLastTgtFailureAddrType InetAddressType,
 iscsiIntrLastTgtFailureAddr InetAddress
 }

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 cccc, [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 }
```

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-- Initiator Login Stats Table

```
iscsiInitiatorLoginStatsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IscsiInitiatorLoginStatsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table of counters which 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 {
    iscsiIntrLoginAcceptRsp      Counter32,
    iscsiIntrLoginOtherFailRsp   Counter32,
    iscsiIntrLoginRedirectRsp   Counter32,
    iscsiIntrLoginAuthFailRsp   Counter32,
    iscsiIntrLoginAuthenticateFails Counter32,
    iscsiIntrLoginNegotiateFails Counter32,
    iscsiIntrLoginAuthorizeFails Counter32
}

iscsiIntrLoginAcceptRsp 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 cccc, Section 11.13.5, Status-Class and Status-Detail"
 ::= { iscsiInitiatorLoginStatsEntry 1 }

iscsiIntrLoginOtherFailRsp OBJECT-TYPE
    SYNTAX      Counter32
    UNITS      "failed logins"
```

MAX-ACCESS read-only

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```
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 cccc, Section 11.13.5, Status-Class and Status-Detail"
 ::= { iscsiInitiatorLoginStatsEntry 2 }

iscsiIntrLoginRedirectRsp 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 cccc, Section 11.13.5, Status-Class and Status-Detail"
 ::= { iscsiInitiatorLoginStatsEntry 3 }

iscsiIntrLoginAuthFailRsp 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 cccc, 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.

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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 cccc, [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 cccc, [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 cccc, [Section 11.13.5](#), Status-Class and Status-Detail"

::= { iscsiInitiatorLoginStatsEntry 7 }

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```
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 cccc, Section 11.14.1, Reason Code"
 ::= { iscsiInitiatorLogoutStatsEntry 1 }

iscsiIntrLogoutOthers OBJECT-TYPE
    SYNTAX      Counter32
    UNITS      "abnormal logouts"
    MAX-ACCESS  read-only
```

STATUS

current

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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 cccc, [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

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```
    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, 7.3, ipsAuthInstanceAttributeEntry"
 ::= { 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 }
```

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-- 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,

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```
    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

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```
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 cccc, 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 cccc, Section 11.12.5, ISID"
 ::= { iscsiSessionAttributesEntry 7 }
```

iscsiSsnInitiatorAlias OBJECT-TYPE

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```
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 cccc, [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 cccc, [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 cccc, [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 cccc, [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 cccc, 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 cccc, 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 cccc, 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

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```
"RFC cccc, 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, 7.3, ipsAuthInstanceAttributeEntry"
 ::= { 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 cccc, 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.

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```
    Default is true."
REFERENCE
  "RFC cccc, 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 cccc, 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 ssss, Section 7.1.1, iSCSIProtocolLevel"
-- RFC Editor: replace ssss in RFC ssss with the RFC number assigned to
-- draft-ietf-storm-iscsi-sam-05 & remove this note.

  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 cccc, Section 13.23, Task Reporting"
 ::= { 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,
    iscsiSsnTxDataOctets     Counter64,
    iscsiSsnRxDataOctets     Counter64,
    iscsiSsnLCTxDataOctets   Counter32,
    iscsiSsnLCRxDataOctets   Counter32
}

iscsiSsnCmdPDUs OBJECT-TYPE
SYNTAX      Counter32
UNITS      "PDUs"
MAX-ACCESS  read-only
```

STATUS

current

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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 }

iscsiSsnTxDataOctets 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 }

iscsiSsnRxDataOctets 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 which 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 }
```

-- 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

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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 cccc, [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 cccc, [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)`

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```
        }
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

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```
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 cccc, 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 cccc, 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
        "[RFCcccc], 13.25 Obsolete 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
        "[RFCcccc], 13.25 Obsolete 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

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```
"RFC cccc, Section 11.12, Login Request"
 ::= { iscsiConnectionAttributesEntry 16 }

--***** Notifications

iscsiTgtLoginFailure NOTIFICATION-TYPE
 OBJECTS {
    iscsiTgtLoginFailures,
    iscsiTgtLastFailureType,
    iscsiTgtLastIntrFailureName,
    iscsiTgtLastIntrFailureAddrType,
    iscsiTgtLastIntrFailureAddr
}
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
}
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

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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

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```
    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
    "[RFCcccc], 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 }
```

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```
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`

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[Page 71]

```
}

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,`

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```
    iscsiIntrLoginOtherFailRsp,
    iscsiIntrLoginRedirectRsp,
    iscsiIntrLoginAuthFailRsp,
    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,

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```
    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 }

iscsiSessionPDUMstatsGroup 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
        "[RFCcccc], 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."

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```
::= { 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,`

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```
    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 }

--*****  
  
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
    "[RFCcccc], 13.25 Obsoleted Keys."
  MODULE      -- this module
  MANDATORY-GROUPS {
    iscsiInstanceAttributesGroup,
    iscsiInstanceSsnErrorStatsGroup,
    iscsiPortalAttributesGroup,
    iscsiNodeAttributesGroup,
    iscsiSessionAttributesGroup,
    iscsiSessionPDUMstatsGroup,
    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

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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."

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```
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
```

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```
"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,  
    iscsiSessionPDUMstatsGroup,  
    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
```

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```
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."
```

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```
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 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:

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`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 [[RFCcccc](#)].

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

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

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

[9. IANA Considerations](#)

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

Descriptor	OBJECT IDENTIFIER value
-----	-----
<code>iscsiMibModule</code>	<code>{ mib-2 142 }</code>

RFC Editor's Note (to be removed prior to publication): this draft makes no additional requests of the IANA.

[10. References](#)

[10.1. Normative References](#)

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 - RFC Editor: replace cccc with the RFC number assigned to [draft-ietf-storm-iscsi-cons-03](#) & remove this note.
 - RFC Editor: replace mmyy with the RFC month and year assigned to [draft-ietf-storm-iscsi-cons-03](#) & remove this note.
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-- [draft-ietf-storm-iscsi-sam-05](#) & remove this note.
-- RFC Editor: replace mmyy with the RFC month and year assigned to
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10.2. Informative References

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11. Acknowledgments

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