               Internet Small Computer System Interface (iSCSI)
                           SCSI Features Update

Abstract

   Internet Small Computer System Interface (iSCSI) is a SCSI
   transport protocol that maps the SCSI family of protocols onto
   TCP/IP. The iSCSI protocol as specified in RFC 7143 (and as
   previously specified by the combination of RFC 3720 and RFC
   5048) is based on the SAM-2 (SCSI Architecture Model - 2)
   version of the SCSI family of protocols. This document
   defines enhancements to the iSCSI protocol to support certain
   additional features of the SCSI protocol that were defined in
   SAM-3, SAM-4, and SAM-5.

   This document is a companion document to RFC 7143.

Status of This Memo

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Table of Contents

1. Introduction

   The original iSCSI protocol [RFC3720] was built based on the [SAM2]
   model for SCSI. Several new features and capabilities have been
   added to the SCSI Architecture Model in the intervening years (at the
   time of publication of this document, SAM-5 was the current version
   of the SCSI Architecture Model). This document is not a complete
   revision of [RFC3720]. Instead, this document is intended as a
   companion document to RFC 7143; this document may also be used as a
   companion document to the combination of [RFC3720] and [RFC5048],
   although both of those RFCs have been obsoleted by [RFC7143].

   For more information on the SCSI Architecture Model and SCSI Primary
   Commands - 4, contact the INCITS T10 Technical Committee for SCSI
   Storage Interfaces at <http://www.t10.org>.

2. Definitions, Acronyms, and Document Summary

2.1. Definitions

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

2.2. Acronyms

   ACA   Auto Contingent Allegiance
   AHS   Additional Header Segment
   ISID   Initiator Session Identifier
   LU   Logical Unit
   PDU   Protocol Data Unit
   SAM-5   SCSI Architecture Model - 5 (see [SAM5])
   TSIH   Target Session Identifying Handle

2.3. New Semantics

   This document specifies new iSCSI semantics. This section summarizes
   the contents of the document.

      Section 3: The mapping of iSCSI objects to SAM-5 objects
                  The iSCSI node may contain both initiator and target
                  capabilities.

      Section 4: New feature use
                  New features need negotiation for use. The
                  negotiation may have an impact on standard INQUIRY
                  data.

Section 5: New command operations
           The PRI field for SCSI command priority has been added
           to the SCSI Command PDU (see Section 5.1.1). The
           Status Qualifier field has been added to the SCSI
           Response PDU (see Section 5.2.1). Sense data may be
           returned (via Autosense) for any SCSI status, not just
           CHECK CONDITION (see Section 5.2.2).

Section 6: New task management functions
           Four new task management functions (QUERY TASK, QUERY
           TASK SET, I_T NEXUS RESET, and QUERY ASYNCHRONOUS
           EVENT) have been added (see Section 6.3). A new
           "Function succeeded" response has been added (see
           Section 6.4.2).

Section 7: New negotiation key
           A new negotiation key has been added to enable the use
           of the new features in Sections 5 and 6.

3. Terminology Mapping

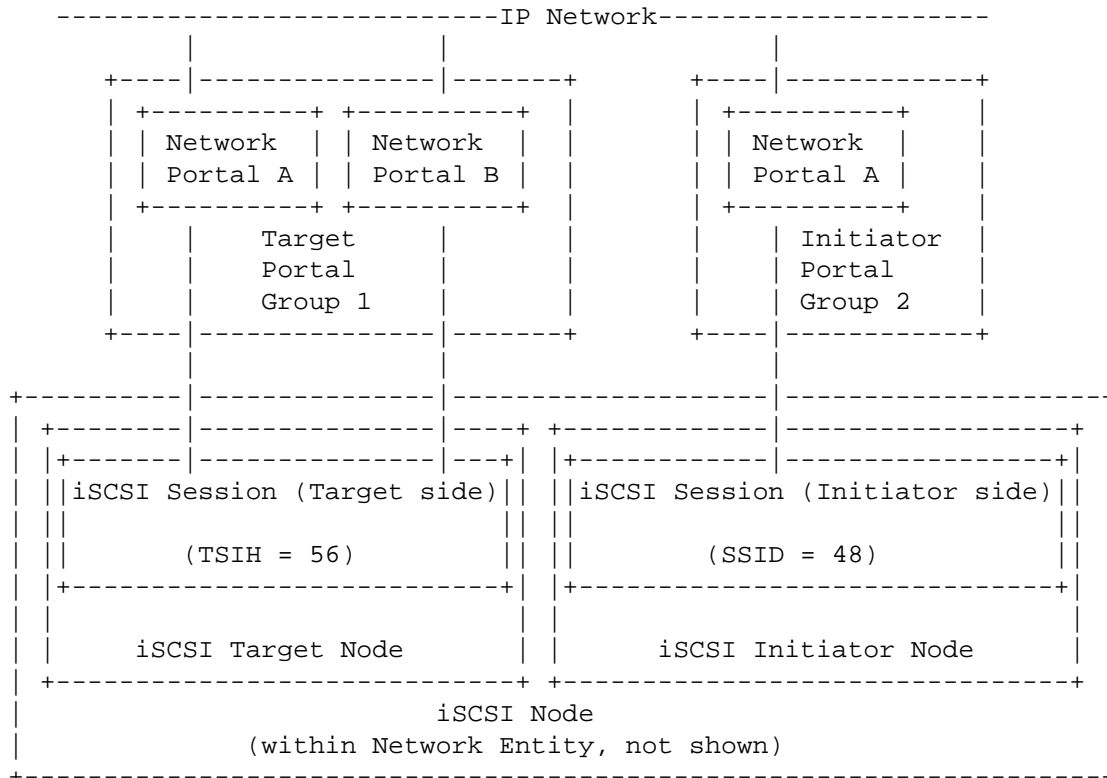   The iSCSI model (defined in [RFC7143]) uses different terminology
   than the SCSI Architecture Model. In some cases, iSCSI uses multiple
   terms to describe what in the SCSI Architecture Model is described
   with a single term. The iSCSI terms and SAM-5 terms are not
   necessarily equivalent, but rather, the iSCSI terms represent
   examples of the objects or classes described in SAM-5 as follows:

```
       Terminology in RFC 7143    | Terminology in SAM-5
     +---------------------------+---------------------------+
     | Network Entity            | none                      |
     +---------------------------+---------------------------+
     | iSCSI Node                | SCSI Device               |
     +---------------------------+---------------------------+
     | iSCSI Name                | SCSI Device Name          |
     +---------------------------+---------------------------+
     | iSCSI Node Name           | SCSI Device Name          |
     +---------------------------+---------------------------+
     | iSCSI Initiator Node      | SCSI Initiator Device     |
     +---------------------------+---------------------------+
     | iSCSI Initiator Name      | SCSI Device Name          |
     +---------------------------+---------------------------+
     | iSCSI Initiator Port      | SCSI Initiator Port       |
     | Identifier; (i.e., iSCSI  | Identifier                |
     | Node Name + ,,,i, + ISID)**|                          |
     +---------------------------+---------------------------+
     | iSCSI Initiator Port Name;| SCSI Initiator Port Name  |
     | (i.e., iSCSI Node Name +  |                           |
     | ,,,i, + ISID)**           |                           |
     +---------------------------+---------------------------+
     | iSCSI Target Node         | SCSI Target Device        |
     +---------------------------+---------------------------+
     | iSCSI Target Name         | SCSI Device Name          |
     +---------------------------+---------------------------+
     | iSCSI Target Port         | SCSI Target Port          |
     | Identifier; (i.e., iSCSI  | Identifier                |
     | Node Name + ,,,t, +       |                           |
     | Target Portal Group Tag)**|                           |
     +---------------------------+---------------------------+
     | iSCSI Target Port Name;   | SCSI Target Port Name     |
     | (i.e., iSCSI Node Name +  |                           |
     | ,,,t, + Target Portal     |                           |
     | Group Tag)**              |                           |
     +---------------------------+---------------------------+
     | iSCSI Target Portal Group | SCSI Target Port          |
     +---------------------------+---------------------------+
     | iSCSI Initiator Name +    | I_T Nexus Identifier      |
     | ',i,' + ISID + iSCSI      |                           |
     | Target Name + ',t,' +     |                           |
     | Target Portal Group Tag   |                           |
     +---------------------------+---------------------------+
     | Target Portal Group Tag   | Relative Port ID          |
     +---------------------------+---------------------------+
```

   ** The text encoding of the ISID value and the Target Portal Group
      Tag value includes an initial ,,0X or ,,0x (see [RFC7143]).

The following diagram shows an example of a combination target device
and initiator device. Such a configuration may exist in a target
device that implements a SCSI Copy Manager. This example shows how a
session that shares Network Portals within a Portal Group may be
established (see Target Portal Group 1). In addition, this example
shows the initiator using a different portal group than the target
portal group, but the initiator portal group sharing Network Portal A
with the target portal group.

```
         ---------------------------IP Network--------------------
              |                   |               |
         +----|---------------|-------+     +----|------------+
         | +---------+ +---------+  |     | +---------+      |
         | | Network | | Network |  |     | | Network |      |
         | | Portal A| | Portal B|  |     | | Portal A|      |
         | +---------+ +---------+  |     | +---------+      |
         |    |   Target    |       |     |    |  Initiator  |
         |    |   Portal     |       |     |    |  Portal     |
         |    |   Group 1    |       |     |    |  Group 2    |
         +----|---------------|-------+     +----|------------+
              |               |                  |
   +----------|---------------|------------------|-------------------+
   | +--------|---------------|----+ +-----------|----------------+  |
   | |+-------|---------------|---+| |+----------|---------------+|  |
   | ||iSCSI Session (Target side)|| ||iSCSI Session (Initiator side)||  |
   | ||                          || ||                           ||  |
   | ||       (TSIH = 56)        || ||       (SSID = 48)         ||  |
   | |+--------------------------+| |+---------------------------+|  |
   | |                           | |                            |  |
   | |     iSCSI Target Node     | |      iSCSI Initiator Node  |  |
   | +---------------------------+ +----------------------------+  |
   |                          iSCSI Node                           |
   |              (within Network Entity, not shown)              |
   +--------------------------------------------------------------+
```

4. New Feature Use

4.1. Negotiation of New Feature Use

   The iSCSIProtocolLevel operational text key (see Section 7.1.1)
   containing a value of "2" MUST be negotiated to enable the use of
   features described in this RFC.

   This is an iSCSI negotiation mechanism that enabled iSCSI support for
   corresponding SCSI capabilities (see [SAM5] and [SPC4]). For this
   reason, negotiation of this key to a value of "2" is necessary but
   not sufficient for use of the SCSI capabilities enabled by the iSCSI
   features in this RFC.

For example, an iSCSI implementation may negotiate this new key to
"2" but respond to the new task management functions (see Section
6.3) with "Task management function not supported" (which indicates a
SCSI error that prevents the function from being performed). In
contrast, if the key is negotiated to "2", an iSCSI implementation
MUST NOT reject a Task Management Function Request PDU that requests
one of the new task management functions (as such a reject would
report an iSCSI protocol error).

4.2. Impact on Standard INQUIRY Data - iSCSI Version Descriptors

The negotiated value of the iSCSIProtocolLevel key is an increment
from the base iSCSI version descriptor value (0960h); see [SPC4]. If
the SCSI device server returns an iSCSI version descriptor in the
standard INQUIRY data, then the value returned in that iSCSI version
descriptor MUST be set to the sum of the base value (0960h) plus the
negotiated value of the iSCSIProtocolLevel key. (For example, if the
negotiated iSCSIProtocolLevel=2, then if an iSCSI version descriptor
is returned in the standard INQUIRY data, it is set to 0962h.)

In support of this functionality, INCITS Technical Committee T10,
which is responsible for SCSI standards, has assigned SCSI version
descriptor codes 0961h-097Fh to RFC 7144 for IANA to manage via the
values 1-31 of the iSCSIProtocolLevel key; see Section 9. The "No
version claimed" description for the value 0 of the
iSCSIProtocolLevel key corresponds to the existing T10 assignment of
the 0960h SCSI version descriptor code to "iSCSI (no version
claimed)" -- for this reason, the assignment of the value 0 in the
IANA registry for the iSCSIProtocolLevel key must not be changed.

5. SCSI Commands

5.1. SCSI Command Additions

   The format of the SCSI Command PDU is:

```
   Byte/     0        |       1       |       2       |       3       |
      /               |               |               |               |
     |0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|
     +---------------+---------------+---------------+---------------+
    0|.|I| 0x01      |F|R|W|. .|ATTR | PRI   |   Reserved            |
     +---------------+---------------+---------------+---------------+
    4|TotalAHSLength | DataSegmentLength                             |
     +---------------+---------------+---------------+---------------+
    8| Logical Unit Number (LUN)                                     |
     +                                                               +
   12|                                                               |
     +---------------+---------------+---------------+---------------+
   16| Initiator Task Tag                                            |
     +---------------+---------------+---------------+---------------+
   20| Expected Data Transfer Length                                 |
     +---------------+---------------+---------------+---------------+
   24| CmdSN                                                         |
     +---------------+---------------+---------------+---------------+
   28| ExpStatSN                                                     |
     +---------------+---------------+---------------+---------------+
   32/ SCSI Command Descriptor Block (CDB)                           /
    +/                                                               /
     +---------------+---------------+---------------+---------------+
   48/ AHS (Optional)                                               /
     +---------------+---------------+---------------+---------------+
    x/ Header Digest (Optional)                                     /
     +---------------+---------------+---------------+---------------+
    y/ (DataSegment, Command Data) (Optional)                       /
    +/                                                               /
     +---------------+---------------+---------------+---------------+
    z/ Data Digest (Optional)                                       /
     +---------------+---------------+---------------+---------------+
```

   The SCSI Command PDU above is duplicated from [RFC7143] for reference
   to show the PRI field. For any field other than the PRI field, the
   text in [RFC7143] supersedes the text in Section 5.1 of this document
   in the event the two documents conflict.

5.1.1. Command Priority (Byte 2)

   The Command Priority (PRI) is a four-bit field that specifies the
   relative scheduling importance of this command in relation to other
   commands already in the task set with SIMPLE task attributes (see
   [SAM5]).

   Section 11 ("iSCSI PDU Formats") of [RFC7143] requires that senders
   set this field to zero. A sender MUST NOT set this field to a value
   other than zero unless the iSCSIProtocolLevel text key defined in
   Section 7.1.1 has been negotiated on the session with a value of "2".

   This field MUST be ignored by iSCSI targets unless the
   iSCSIProtocolLevel text key with a value of "2" as defined in Section
   7.1.1 was negotiated on the session.

   See [SAM5] for additional considerations on the use of the Command
   Priority field.

5.2. SCSI Response Additions

   The format of the SCSI Response PDU is:

```
 Byte/       0       |       1       |       2       |       3       |
   /                 |               |               |               |
   |0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|
   +---------------+---------------+---------------+---------------+
  0|.|.| 0x21      |1|. .|o|u|O|U|.| Response      | Status        |
   +---------------+---------------+---------------+---------------+
  4|TotalAHSLength | DataSegmentLength                             |
   +---------------+---------------+---------------+---------------+
  8| Status Qualifier              | Reserved                      |
   +---------------+---------------+---------------+---------------+
 12| Reserved                                                      |
   +---------------+---------------+---------------+---------------+
 16| Initiator Task Tag                                            |
   +---------------+---------------+---------------+---------------+
 20| SNACK Tag or Reserved                                         |
   +---------------+---------------+---------------+---------------+
 24| StatSN                                                        |
   +---------------+---------------+---------------+---------------+
 28| ExpCmdSN                                                      |
   +---------------+---------------+---------------+---------------+
 32| MaxCmdSN                                                      |
   +---------------+---------------+---------------+---------------+
 36| ExpDataSN or Reserved                                         |
   +---------------+---------------+---------------+---------------+
 40| Bidirectional Read Residual Count or Reserved                 |
   +---------------+---------------+---------------+---------------+
 44| Residual Count or Reserved                                    |
   +---------------+---------------+---------------+---------------+
 48| Header-Digest (Optional)                                      |
   +---------------+---------------+---------------+---------------+
   / Data Segment (Optional)                                       /
 +/                                                                /
   +---------------+---------------+---------------+---------------+
   | Data-Digest (Optional)                                        |
   +---------------+---------------+---------------+---------------+
```

   The SCSI Response PDU above is duplicated from [RFC7143] for
   reference to show the Status Qualifier field. For any field other
   than the Status field, the Status Qualifier field, and the Data
   Segment - Sense and Response Data Segment field, the text in
   [RFC7143] supersedes the text in Section 5.2 of this document in the
   event the two documents conflict.

5.2.1. Status Qualifier

   The Status Qualifier provides additional status information (see
   [SAM5]).

   As defined in Section 11 ("iSCSI PDU Formats") of [RFC7143],
   compliant senders already set this field to zero. Compliant senders
   MUST NOT set this field to a value other than zero unless the
   iSCSIProtocolLevel text key with a value of "2" as defined in Section
   7.1.1 was negotiated on the session.

   This field MUST be ignored by receivers unless the iSCSIProtocolLevel
   text key with a value of "2" as defined in Section 7.1.1 was
   negotiated on the session.

5.2.2. Data Segment - Sense and Response Data Segment

   Section 11.4.7 of [RFC7143] specifies that iSCSI targets MUST support
   and enable Autosense. If Status is CHECK CONDITION (0x02), then the
   Data Segment MUST contain sense data for the failed command. While
   [RFC7143] does not make any statements about the state of the Data
   Segment when the Status is not CHECK CONDITION (0x02) (i.e., the Data
   Segment is not prohibited from containing sense data when the Status
   is not CHECK CONDITION), negotiation of the iSCSIProtocolLevel text
   key with a value of "2" as defined in Section 7.1.1 explicitly
   indicates that the Data Segment MAY contain sense data at any time,
   no matter what value is set in the Status field.

6. Task Management Functions

6.1. Task Management Function Request PDU

```
 Byte/     0       |       1       |       2       |       3       |
   /               |               |               |               |
  |0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|
   +--------------+--------------+--------------+--------------+
 0|.|I| 0x02      |1| Function   | Reserved                   |
   +--------------+--------------+--------------+--------------+
 4|TotalAHSLength | DataSegmentLength                          |
   +--------------+--------------+--------------+--------------+
 8| Logical Unit Number (LUN)                                  |
  +                                                            +
12|                                                            |
   +--------------+--------------+--------------+--------------+
16| Initiator Task Tag                                         |
   +--------------+--------------+--------------+--------------+
20| Referenced Task Tag or 0xffffffff                          |
   +--------------+--------------+--------------+--------------+
24| CmdSN                                                      |
   +--------------+--------------+--------------+--------------+
28| ExpStatSN                                                  |
   +--------------+--------------+--------------+--------------+
32| RefCmdSN or Reserved                                       |
   +--------------+--------------+--------------+--------------+
36| ExpDataSN or Reserved                                      |
   +--------------+--------------+--------------+--------------+
40| Reserved                                                   /
  +/                                                           /
   +--------------+--------------+--------------+--------------+
48| Header-Digest (Optional)                                   |
   +--------------+--------------+--------------+--------------+
```

   The Task Management Function Request PDU above is duplicated from
   [RFC7143] for reference only. [RFC7143] supersedes the text in
   Sections 6.1 and 6.2 of this document in the event the two documents
   conflict.

6.2. Existing Task Management Functions

   Section 11.5 of [RFC7143] defines the semantics used to request that
   SCSI task management functions be performed. The following task
   management functions are defined:

        1 -   ABORT TASK
        2 -   ABORT TASK SET
        3 -   CLEAR ACA
        4 -   CLEAR TASK SET
        5 -   LOGICAL UNIT RESET
        6 -   TARGET WARM RESET
        7 -   TARGET COLD RESET
        8 -   TASK REASSIGN

6.3. Task Management Function Additions

   Additional task management function codes are listed below. For a
   more detailed description of SCSI task management, see [SAM5].

        9 - QUERY TASK - determine if the command identified by the
             Referenced Task Tag field is present in the task set.

        10 - QUERY TASK SET - determine if any command is present in the
             task set for the I_T_L Nexus on which the task management
             function was received.

        11 - I_T NEXUS RESET - perform an I_T nexus loss function (see
             [SAM5]) for the I_T nexus on which the task management function
             was received.

        12 - QUERY ASYNCHRONOUS EVENT - determine if there is a unit
             attention condition or a deferred error pending for the I_T_L
             nexus on which the task management function was received.

   These task management function requests MUST NOT be sent unless the
   iSCSIProtocolLevel text key with a value of "2" as defined in Section
   7.1.1 was negotiated on the session.

   Any compliant initiator that sends any of the new task management
   functions defined in this section MUST also support all new task
   management function responses (as specified in Section 6.4.2).

   For all of the task management functions detailed in this section,
   the Task Management Function Response MUST be returned as detailed in
   Section 6.4.

The iSCSI target MUST ensure that no responses for the commands
covered by a task management function are sent to the iSCSI initiator
port after the Task Management response except for commands covered
by a TASK REASSIGN, QUERY TASK, or QUERY TASK SET.

If a QUERY TASK is issued for a task created by an immediate command,
then RefCmdSN MUST be that of the Task Management request itself
(i.e., CmdSN and RefCmdSN are equal); otherwise, RefCmdSN MUST be set
to the CmdSN of the task to be queried (lower than CmdSN).

If the connection is still active (it is not undergoing an implicit
or explicit logout), QUERY TASK MUST be issued on the same connection
to which the task to be queried is allegiant at the time the Task
Management request is issued. If the connection is implicitly or
explicitly logged out (i.e., no other request will be issued on the
failing connection and no other response will be received on the
failing connection), then a QUERY TASK function request may be issued
on another connection. This Task Management request will then
establish a new allegiance for the command being queried.

At the target, a QUERY TASK function MUST NOT be executed on a Task
Management request; such a request MUST result in Task Management
response of "Function rejected".

For the I_T NEXUS RESET function, the target device MUST respond to
the function as defined in [SAM5]. Each logical unit accessible via
the receiving I_T NEXUS MUST behave as dictated by the I_T nexus loss
function in [SAM5] for the I_T nexus on which the task management
function was received. The target device MUST drop all connections
in the session over which this function is received. Independent of
the DefaultTime2Wait and DefaultTime2Retain values applicable to the
session over which this function is received, the target device MUST
consider each participating connection in the session to have
immediately timed out, leading to FREE state. The resulting timeouts
cause the session timeout event defined in [RFC7143], which in turn
triggers the I_T nexus loss notification to the SCSI layer as
described in [RFC7143].

6.3.1. LUN Field

This field is required for functions that address a specific LU
(i.e., ABORT TASK, CLEAR TASK SET, ABORT TASK SET, CLEAR ACA, LOGICAL
UNIT RESET, QUERY TASK, QUERY TASK SET, and QUERY ASYNCHRONOUS EVENT)
and is reserved in all others.

6.3.2. Referenced Task Tag

   The Reference Task Tag is the Initiator Task Tag of the task to be
   aborted for the ABORT TASK function, reassigned for the TASK REASSIGN
   function, or queried for the QUERY TASK function. For all other
   functions, this field MUST be set to the reserved value 0xffffffff.

6.3.3. RefCmdSN

   If a QUERY TASK is issued for a task created by an immediate command
   then RefCmdSN MUST be that of the Task Management request itself
   (i.e., CmdSN and RefCmdSN are equal).

   For a QUERY TASK of a task created by non-immediate command RefCmdSN
   MUST be set to the CmdSN of the task identified by the Referenced
   Task Tag field. Targets must use this field as described in section
   11.6.1 of [RFC7143] when the task identified by the Referenced Task
   Tag field is not in the task set.

6.4. Task Management Function Responses

6.4.1. Task Management Function Response PDU

```
    Byte/       0       |       1       |       2       |       3       |
       /               |               |               |               |
      |0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|0 1 2 3 4 5 6 7|
      +---------------+---------------+---------------+---------------+
    0|.|.| 0x22       |1| Reserved    | Response      | Reserved      |
      +---------------+---------------+---------------+---------------+
    4|TotalAHSLength | DataSegmentLength                             |
      +---------------+-----------------------------------------------+
    8| Additional Response Information               | Reserved      |
      +-----------------------------------------------+---------------+
   12| Reserved                                                      |
      +---------------+---------------+---------------+---------------+
   16| Initiator Task Tag                                            |
      +---------------+---------------+---------------+---------------+
   20| Reserved                                                      |
      +---------------+---------------+---------------+---------------+
   24| StatSN                                                        |
      +---------------+---------------+---------------+---------------+
   28| ExpCmdSN                                                      |
      +---------------+---------------+---------------+---------------+
   32| MaxCmdSN                                                      |
      +---------------+---------------+---------------+---------------+
   36/ Reserved                                                      /
    +/                                                               /
      +---------------+---------------+---------------+---------------+
   48| Header-Digest (Optional)                                      |
      +---------------+---------------+---------------+---------------+
```

   Section 11.6 of [RFC7143] defines the semantics used for responses to
   SCSI task management functions. The following responses are defined
   in [RFC7143]:

      0   - Function Complete
      1   - Task does not exist
      2   - LUN does not exist
      3   - Task still allegiant
      4   - Task allegiance reassignment not supported
      5   - Task management function not supported
      6   - Function authorization failed
      255 - Function rejected

The Task Management Function Response PDU above and the list of task
management function responses above are duplicated from [RFC7143] for
reference only. [RFC7143] supersedes the text in section 6.4.1 of
this document in the event the two documents conflict.

Responses to new task management functions (see Section 6.4.2) are
listed below. In addition, a new task Management response is listed
below. For a more detailed description of SCSI task management
responses, see [SAM5].

For the functions QUERY TASK, QUERY TASK SET, I_T NEXUS RESET, and
QUERY ASYNCHRONOUS EVENT, the target performs the requested Task
Management function and sends a Task Management response back to the
initiator.

6.4.2. Task Management Function Response Additions

The new response is listed below:

        7 - Function succeeded

In symbolic terms Response value 7 maps to the SCSI service response
of FUNCTION SUCCEEDED in [SAM5].

The Task Management Function Response of "Function succeeded" MUST be
supported by an initiator that sends any of the new task management
functions (see Section 6.3).

For the QUERY TASK function, if the specified task is in the task
set, then the logical unit returns a Response value of "Function
succeeded", and additional response information is returned as
specified in [SAM5]. If the specified task is not in the task set,
then the logical unit returns a Response value of "Function
complete".

For the QUERY TASK SET function, if there is any command present in
the task set from the specified I_T_L nexus, then the logical unit
returns a Response value of "Function succeeded". If there are no
commands present in the task set from the specified I_T_L nexus, then
the logical unit returns a Response value of "Function complete".

For the I_T NEXUS RESET function, after completion of the events
described in Section 6.3 for this function, the logical unit returns
a Response value of "Function complete". However, because the target
drops all connections, the Service Response (defined by [SAM5]) for
this SCSI task management function may not be reliably delivered to
the issuing initiator port.

For the QUERY ASYNCHRONOUS EVENT, if there is a unit attention
condition or deferred error pending for the specified I_T_L nexus,
then the logical unit returns a Response value of "Function
succeeded", and additional response information is returned as
specified in [SAM5]. If there is no unit attention or deferred error
pending for the specified I_T_L nexus, then the logical unit returns
a Response value of "Function complete".

6.5. Task Management Requests Affecting Multiple Tasks

Section 4.1 of [RFC5048] defines the notion of "affected tasks" in
multi-task abort scenarios. This section adds to the list included
in that section by defining the tasks affected by the I_T NEXUS RESET
function.

>   I_T NEXUS RESET: All outstanding tasks received on the I_T nexus
>   on which the function request was received for all logical
>   units accessible to the I_T nexus.

Sections 4.1.2 and 4.1.3 of [RFC5048] identify semantics for task
management functions that involve multi-task abort operations. If an
iSCSI implementation supports the I_T NEXUS RESET function, it MUST
also support the protocol behavior as defined in those sections and
follow the sequence of actions as described in those sections when
processing the I_T NEXUS RESET function.

7. Login/Text Operational Text Keys

7.1. New Operational Text Keys

7.1.1. iSCSIProtocolLevel

Use: LO, IO
Irrelevant when: SessionType = Discovery
Senders: Initiator and Target
Scope: SW

iSCSIProtocolLevel=<numerical-value-from-0-to-31>

Default is 1.
Result function is Minimum.

This key is used to negotiate the use of iSCSI features that require
different levels of protocol support (e.g., PDU formats, end-node
semantics) for proper operation.

Negotiation of the iSCSIProtocolLevel key to a value corresponding to
an RFC indicates that both negotiating parties are compliant to the
RFC in question and agree to support the corresponding PDU formats
and semantics on that iSCSI session. Features using this key are
expected to be cumulative.

An iSCSIProtocolLevel key negotiated to "0" indicates that the
implementation does not claim a specific iSCSI protocol level.

An iSCSIProtocolLevel key negotiated to "1" indicates that the
implementation claims compliance with [RFC7143].

An iSCSIProtocolLevel key negotiated to "2" is required to enable use
of features defined in this RFC.

If the negotiation answer is ignored by the acceptor, or the answer
from the remote iSCSI end point is key=NotUnderstood, then the
features defined in this RFC, and the features defined in any RFC
requiring a key value greater than "2", MUST NOT be used.

8. Security Considerations

Command priorities are relative values, not absolute values (see
[SAM5], and affect collections of commands, not necessarily
individual commands (see [SAM5]). If command priority is supported,
it should be implemented in a fashion that avoids unwanted reduction
or denial of service.

All the iSCSI-related security text in [RFC3723] is directly
applicable to this document. The security text in [RFC7143] is
directly applicable as well.

9. IANA Considerations

   This document modifies or creates a number of iSCSI-related
   registries.

   The following iSCSI-related registries are modified.

   1. iSCSI Task Management Functions Codes

      Name of the existing registry: "iSCSI Task Management Function
      Codes"

      The following entries have been added:

         9 - QUERY TASK, RFC 7144

         10 - QUERY TASK SET, RFC 7144

         11 - I_T NEXUS RESET, RFC 7144

         12 - QUERY ASYNCHRONOUS EVENT, RFC 7144

         13-127 - Unassigned

   2. iSCSI Login/Text Keys

      Name of the existing registry: "iSCSI Login/Text Keys"

      Fields to record in the registry: Assigned value and its
      associated RFC reference.

      The following entry has been added:

         iSCSIProtocolLevel, RFC 7144

   IANA has created the following iSCSI-related registries.

   3. iSCSI Protocol Level

      Name of new registry: "iSCSI Protocol Level"

      Namespace details: Numerical values from 0 to 31

      Information that must be provided to assign a new value: An IESG-
      approved Standards Track specification defining the semantics and
      interoperability requirements of the proposed new value and the
      fields to be recorded in the registry.

Assignment policy:

The assignments of these values must be coordinated with the
INCITS T10 committee; therefore, review by an expert that
maintains an association with that committee is required prior to
IESG approval of the associated specification. After creation of
the registry, values are to be assigned sequentially (for example,
any value greater than 4 will not be assigned until after the
value 4 has been assigned).

Special care must be taken in the assignment of new values in this
registry. Compatibility and interoperability will be adversely
impacted if proper care is not exercised. Features using this key
are expected to be cumulative. For example, since this document
explicitly lists only value 2 for the features listed in this
document, it is expected that a new RFC assigning value 3 will
also have the features listed in this RFC, and therefore such an
RFC is expected to either revise or replace this RFC. Assignments
that do not follow this policy should be reviewed and approved by
the INCITS T10 committee.

3-31: range available to IANA for assignment in this registry.

Fields to record in the registry: Assigned value, description, and
its associated RFC reference.

The following entries have been added:

```
   Value   Description         Reference

     0      No version claimed  RFC 7144

     1      RFC 7143            [RFC7143]

     2      RFC 7144            RFC 7144

    3-31   Unassigned
```

Allocation Policy: Expert Review and Standards Action [RFC5226]

4. iSCSI Task Management Function Response Codes

Name of new registry: "iSCSI Task Management Function Response
Codes"

Namespace details: Numerical values that can fit in 8 bits.

   Information that must be provided to assign a new value: An IESG-
   approved specification defining the semantics and interoperability
   requirements of the proposed new value and the fields to be
   recorded in the registry.

   Assignment policy:

   If the requested value is not already assigned, it may be assigned
   to the requester.

   8-254: Range available to IANA for assignment in this registry.

   Fields to record in the registry: Assigned value, Operation Name,
   and its associated RFC reference.

   The following entries have been added:

      0 - Function complete, [RFC7143]

      1 - Task does not exist, [RFC7143]

      2 - LUN does not exist, [RFC7143]

      3 - Task still allegiant, [RFC7143]

      4 - Task allegiance reassignment not supported, [RFC7143]

      5 - Task management function not supported, [RFC7143]

      6 - Function authorization failed, [RFC7143]

      7 - Function succeeded, RFC 7144

      8-254 - Unassigned

      255 - Function rejected, [RFC7143]

   Allocation Policy: Standards Action [RFC5226]

10. References

10.1. Normative References

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10.2. Informative References

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11. Acknowledgements

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