Internet Small Computer Systems Interface (iSCSI) SCSI Features Update
draft-ietf-storm-iscsi-sam-07.txt

Abstract

   Internet Small Computer Systems Interface (iSCSI) is a SCSI
   transport protocol that maps the SCSI family of protocols onto
   TCP/IP. The iSCSI protocol as specified in [draft-ietf-storm-
   iscsi-cons-xx] (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 [draft-ietf-storm-
   iscsi-cons-xx].

      RFC EDITORS NOTE: The above references to [draft-ietf-storm-
      iscsi-cons-xx] should reference the RFC number assigned to
      that document, and this note should be removed.

This Internet-Draft will expire December, 2013.

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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 [draft-ietf-storm-iscsi-
cons-xx]; this document may also be used as a companion document
to the combination of [RFC3720] and [RFC5048], although both of
those RFCs have been obsolete by [draft-ietf-storm-iscsi-cons-
xx].

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    RFC EDITORS NOTE: The above references to [draft-ietf-storm-
    iscsi-cons-xx] should reference the RFC number assigned to
    that document, and this note should be removed.
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```

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

```
ISID      Initiator Session Identifier
LU        Logical Unit
PDU       Protocol Data Unit
SAM-4     SCSI Architecture Model - 4 (see [SAM4])
SAM-5     SCSI Architecture Model - 5 (see [SAM5])
TMF       Task Management Function
```

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: The protocol used to negotiate the use of the new
                   capabilities described in this document.

        Section 5: New Command operations

                   The PRI field for SCSI command priority has been
                   added to the SCSI command PDU (see 5.1.1).
                   The Status Qualifier field has been added to the
                   SCSI response PDU (see 5.2.1).
                   Sense data may be returned (via autosense) for any
                   SCSI status, not just CHECK CONDITION (see 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 6.3).
                   A new "function succeeded" response has been added
                   (see 6.4.2).

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

3.   Terminology Mapping

     The iSCSI model (defined in [RFC-cons]) 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:

        RFC EDITORS NOTE: The above reference to [RFC-cons] should
        reference the RFC number assigned to [draft-ietf-storm-iscsi-
        cons-xx], and this note should be removed.

```
+----------------------------+--------------------------+
| RFCxxx Terminology         | SAM-5 Terminology        |
+----------------------------+--------------------------+
| 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)*1|                          |
+----------------------------+--------------------------+
| iSCSI Initiator Port Name; | SCSI Initiator Port Name |
| (i.e., iSCSI Node Name +   |                          |
| ,,,i, + ISID)*1            |                          |
+----------------------------+--------------------------+
| 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)*1 |                          |
+----------------------------+--------------------------+
| iSCSI Target Port Name;    | SCSI Target Port Name    |
| (i.e., iSCSI Node Name +   |                          |
| ,,,t, + Target Portal      |                          |
| Group Tag)*1               |                          |
+----------------------------+--------------------------+
| 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         |
+----------------------------+--------------------------+
```

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

```
         ---------------------------------------------------
      RFC EDITORS NOTE: The above reference (in row 1) to [RFCxxx]
      should reference this RFC, and this note should be removed.

      The above reference to [RFC-cons] should reference the RFC
      number assigned to [draft-ietf-storm-iscsi-cons-xx], and this
      note should be removed.
         ---------------------------------------------------
```

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 7.1.1)
containing a value of "2" MUST be negotiated to enable the use of
features described in this RFC.

The iSCSIProtocolLevel operational text key (see 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 hse 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 6.3)
with a "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

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).

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 [RFC-cons] for
   reference to show the PRI field. For any field other than the
   PRI field, the text in [RFC-cons] supersedes the text in section
   5.1 of this document in the event the two documents conflict.

      RFC EDITORS NOTE: The above references to [RFC-cons] should
      reference the RFC number assigned to [draft-ietf-storm-iscsi-
      cons-xx], and this note should be removed.

5.1.1 Command Priority (byte 2)

The Command Priority (PRI) is a four (4) bit field that specifies
the relative scheduling importance of this task in relation to
other SIMPLE tasks already in the task set (see [SAM4]).

Section 11, iSCSI PDU Formats of [RFC-cons], 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".

```
      ---------------------------------------------------------
      RFC EDITORS NOTE: The above reference to [RFC-cons] should
      reference the RFC number assigned to [draft-ietf-storm-iscsi-
      cons-xx], and this note should be removed.
      ---------------------------------------------------------
```

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 special considerations on the use of the 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 [RFC-cons] 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
[RFC-cons] supersedes the text in section 5.2 of this document in
the event the two documents conflict.

```
   ----------------------------------------------------------
   RFC EDITORS NOTE: The above references to [RFC-cons] should
   reference the RFC number assigned to [draft-ietf-storm-iscsi-
   cons-xx], and this note should be removed.
   ----------------------------------------------------------
```

5.2.1 Status Qualifier

The Status Qualifier provides additional status information (see
[SAM4]).

As defined in Section 11, iSCSI PDU Formats of [RFC-cons],
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.

```
   ----------------------------------------------------------
   RFC EDITORS NOTE: The above reference to [RFC-cons] should
   reference the RFC number assigned to [draft-ietf-storm-iscsi-
```

cons-xx], and this note should be removed.

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 [RFC-cons] 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 [RFC-cons] 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.

    RFC EDITORS NOTE: The above references to [RFC-cons] should
    reference the RFC number assigned to [draft-ietf-storm-iscsi-
    cons-xx], and this note should be removed.
    ----

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
     [RFC-cons] for reference only. [RFC-cons] supersedes the text in

   section 6.1 and 6.2 of this document in the event the two
   documents conflict.

          RFC EDITORS NOTE: The above references to [RFC-cons] should
          reference the RFC number assigned to [draft-ietf-storm-iscsi-
          cons-xx], and this note should be removed.

6.2   Existing Task Management Functions

   Section 11.5 of [RFC-cons] defines the semantics used to request
   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

          RFC EDITORS NOTE: The above references to [RFC-cons] should
          reference the RFC number assigned to [draft-ietf-storm-iscsi-
          cons-xx], and this note should be removed.

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 - determines 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 a
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 [SAM4]. Each logical unit accessible via the receiving I_T NEXUS MUST behave as dictated by the I_T nexus loss function in [SAM4] 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 value 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 [RFC-cons], which in turn

triggers the I_T nexus loss notification to the SCSI layer as described in [RFC-cons].

```
    ---------------------------------------------------------
    RFC EDITORS NOTE: The above references to [RFC-cons] should
    reference the RFC number assigned to [draft-ietf-storm-iscsi-
    cons-xx], and this note should be removed.
    ---------------------------------------------------------
```

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 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 [RFC-cons] when the task
  identified by the Referenced Task Tag field is not in the task
  set.

      RFC EDITORS NOTE: The above references to [RFC-cons] should
      reference the RFC number assigned to [draft-ietf-storm-iscsi-
      cons-xx], and this note should be removed.

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 [RFC-cons] defines the semantics used for
responses to SCSI Task Management Functions. The following
responses are defined in [RFC-cons]:

    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
[RFC-cons] for reference only. [RFC-cons] supersedes the text in
section 6.4.1 of this document in the event the two documents
conflict.

    RFC EDITORS NOTE: The above references to [RFC-cons] should
    reference the RFC number assigned to [draft-ietf-storm-iscsi-
    cons-xx], and this note should be removed.

Responses to new task management functions (see 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 [SAM4].

The task management function response of "Function succeeded"
MUST be supported by an initiator that sends any of the new task
management functions (see 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 [SAM4]) 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

include 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.

[Section 4.1.2 of [RFC5048]](#) and [section 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.
An operational value of iSCSI ProtocolLevel = "x" on an iSCSI
session requires that the iSCSI protocol semantics on that iSCSI
session be a logical superset of the capabilities in all RFCs
that have claimed values of an iSCSIProtocolLevel less than "x".

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 [RFC-cons].

RFC EDITORS NOTE: The above reference to [RFC-cons] should

reference the RFC number assigned to [draft-ietf-storm-iscsi-cons-xx], and this note should be removed.

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

Poor implementations (those that do not observe the requirements described in [SAM5]) may allow the priority field (see 5.1.1) to be used to create a denial of service attack.

All the iSCSI-related security text in [RFC3723] is also directly applicable to this document.

RFC EDITORS NOTE: The above reference to [RFC-cons] should reference the RFC number assigned to [draft-ietf-storm-iscsi-cons-xx], and this note should be removed.
----

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 TMF Codes"

   The name of this registry should be changed to: "iSCSI Task Management Function Codes".

   Additional entries:

   9, QUERY TASK, [RFCxxx]

   10, QUERY TASK SET, [RFCxxx]

   11, I_T NEXUS RESET, [RFCxxx]

   12, QUERY ASYNCHRONOUS EVENT, [RFCxxx]

      RFC EDITORS NOTE: The above reference to [RFCxxx] should
      reference this RFC, and this note should be removed.
      ----

   2. iSCSI Login/Text Keys

      Name of the existing registry: "iSCSI Text Keys"

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

      iSCSIProtocolLevel, [RFCxxx]

      RFC EDITORS NOTE: The above references to [RFCxxx] should
      reference this RFC, and this note should be removed.

   This document creates the following iSCSI-related registries for
   IANA to manage.

   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 draft explicitly lists only value 2 for the
      features listed in this draft, 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 reserved by IANA for assignment in this registry.

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

0, [RFCxxx]

1, [RFC-cons]

2, [RFCxxx]

RFC EDITORS NOTE: The above references to [RFCxxx] should
reference this RFC, and this note should be removed. The
above references to [RFC-cons] should reference the [draft-
ietf-storm-iscsi-cons-xx] document, and this note should be
removed.

Allocation Policy:

Expert review ([IANA]) and Standards Action ([IANA])

4. iSCSI Task Management 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 reserved by iANA for assignment in this registry.

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

0x0, Function complete, [RFC-cons]

0x1, Task does not exist, [RFC-cons]

0x2, LUN does not exist, [RFC-cons]

0x3, Task still allegiant, [RFC-cons]

0x4, Task allegiance reassignment not supported, [RFC-cons]

0x5, Task management function not supported, [RFC-cons]

0x6, Function authorization failed, [RFC-cons]

0x7, Function succeeded, [RFCxxx]

255, Function rejected, [RFC-cons]

```
------------------------------------------------------------
```
RFC EDITORS NOTE: The above reference to [RFCxxx] should
reference this RFC, and this note should be removed.

The above references to [RFC-cons] should reference the
[draft-ietf-storm-iscsi-cons-xx] document, and this note
should be removed.
```
------------------------------------------------------------
```

Allocation Policy:

Standards Action ([IANA])

10. References

10.1 Normative References

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

[RFC3723]   Aboba, B., Tseng, J., Walker, J., Rangan, V., and
                Travostino, F., "Securing Block Storage Protocols
                over IP", RFC 3723, April 2004.

[RFC5048]   Chadalapaka, M., "Internet Small Computer System
                Interface (iSCSI) Corrections and Clarifications",
                RFC 5048, October 2007.

[draft-ietf-storm-iscsi-cons-xx]   Chadalapaka, M., Satran, J.,
                Kalman, M., "iSCSI Protocol (consolidated)", RFC xxx,
                Date 2011.

        RFC EDITORS NOTE: The above references to [draft-ietf-storm-
        iscsi-cons-xx] and [RFCxxx] should reference the RFC number
        assigned to that draft, and this note should be removed.

    [IANA]   Narten, T. and H. Alvestrand, "Guidelines for Writing
                    an IANA Considerations Section in RFCs", BCP 26, RFC
                    5226, May 2008.

    [SAM2]   T10/1157D, SCSI Architecture Model - 2 (SAM-2).

    [SAM4]   ISO/IEC 14776-414, SCSI Architecture Model - 4 (SAM-
                    4).

    [SAM5]   T10/2104D rev r04, SCSI Architecture Model - 5 (SAM-
                    5), Committee Draft.

    [SPC4]   T10/1731D rev r36, SCSI Primary Commands - 4 (SPC-4),
                    Committee Draft.

10.2   Informative References

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

10.3   Additional Reference Sources

  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.

11.   Acknowledgements

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  The following individuals directly contributed to identifying

[RFCxxx] issues and/or suggesting resolutions to the issues
    clarified in this document: David Black, Rob Elliott. This
    document benefited from all of these contributions.

          RFC EDITORS NOTE: The above reference to [RFCxxx] should
          reference this RFC, and this note should be removed.

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