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Internet Small Computer Systems Interface (iSCSI) SCSI Features Update
draft-ietf-storm-iscsi-sam-06.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.

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 [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 6.2).
                        A new "function succeeded" response has been added
                        (see 6.3.1).

        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 [RFC3720]) 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:

    +----------------------------+---------------------------+
    | 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 [RFC3720]).

RFC EDITORS NOTE: The above reference (in row 1) to [RFCxxx]
should reference this RFC, 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)               |
+--------------------------------------------------------------+
```
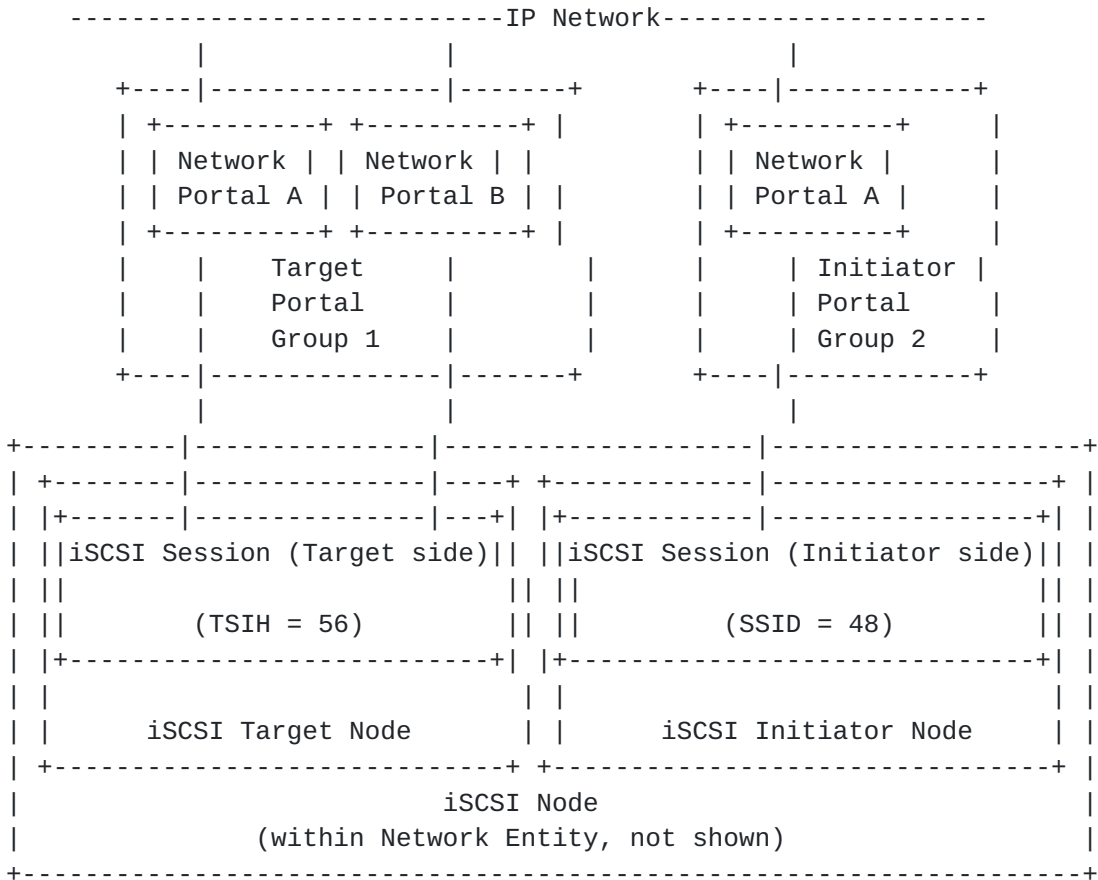
4.   New Feature Use

4.1   Negotiation of New Feature Use

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

Note that an operational value of "2" or higher for this key on
an iSCSI session does not influence the SCSI level features in
any way on that I_T nexus. An operational value of "2" or higher
for this key permits the iSCSI-related features defined in this
document to be used on all connections on this iSCSI session.
SCSI level hand-shakes (e.g. commands, mode pages) eventually
determine the existence or lack of various SAM-5 features
available for the I_T nexus between the two SCSI end points). To
summarize, negotiation of this key to "2" or higher is a
necessary but not a sufficient condition of SAM-5 compliant
feature usage at the SCSI protocol level.

For example, an iSCSI implementation may negotiate this new key
to "2" but respond to the new task management functions (see 6.2)
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 (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)                                   /
   +--------------+--------------+--------------+--------------+
```

5.1.1 Command Priority (byte 2)

The Command Priority (PRI) specifies the relative scheduling
importance of this task in relation to other SIMPLE tasks already
in the task set (see [SAM4]).

Section 10, iSCSI PDU Formats of [RFC3720], 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" or higher.

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

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)                                    |
  +--------------+--------------+--------------+--------------+
```

5.2.1 Status Qualifier

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

As defined in Section 10, iSCSI PDU Formats of [RFC3720], 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" or higher 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" or higher as defined in section 7.1.1 was negotiated on the session.

5.2.2 Data Segment - Sense and Response Data Segment

Section 10.4.7 of [RFC3720] 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 [RFC3720] 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" or higher 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   Existing Task Management Functions

Section 10.5 of [RFC3720] 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

6.2   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" or higher 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 6.3.1).

For all of the task management functions detailed in this
section, the Task Management function response MUST be returned
as detailed in section 6.3 Task Management Function Response.

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 [RFC3720], which in turn
triggers the I_T nexus loss notification to the SCSI layer as
described in [RFC3720].

6.2.1 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.

6.2.2 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.

6.2.3 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 10.6.1 of [RFC3720] when the task identified
by the Referenced Task Tag field is not in the task set.

6.3   **Task Management Function Responses**

```
 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 10.6 of [RFC3720] defines the semantics used for
   responses to SCSI Task Management Functions. The following
   responses are defined in [RFC3720]:

      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.

   Responses to new task management functions (see 6.3.1) 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.

6.3.1 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 6.2).

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 6.2 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.

6.4   **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 "2" or higher 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

At the time of writing this document does not introduce any new
security considerations other than those described in [RFC3720].
Consequently, all the iSCSI-related security text in [RFC3723] is
also directly applicable to this document.

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"
   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).

        1 and 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]

        2, [RFCxxx]

        RFC EDITORS NOTE: The above references to [RFCxxx] should
        reference this RFC, 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 TMF 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, [RFC3720]

   0x1, Task does not exist, [RFC3720]

   0x2, LUN does not exist, [RFC3720]

   0x3, Task still allegiant, [RFC3720]

   0x4, Task allegiance reassignment not supported, [RFC3720]

   0x5, Task management function not supported, [RFC3720]

   0x6, Function authorization failed, [RFC3720]

   0x7, Function succeeded, [RFCxxx]

   255, Function rejected, [RFC3720]

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

   Allocation Policy:

Standards Action ([IANA])

10. References

10.1 Normative References

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       RFC EDITORS NOTE: The above references to [draft-ietf-storm-
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[IANA]   Narten, T. and H. Alvestrand, "Guidelines for Writing
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[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-
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[SPC4]   T10/1731D rev r23, SCSI Primary Commands - 4 (SPC-4),
             Committee Draft.

10.2   Additional Reference Sources

For more information on the SCSI Architecture Model, contact the
INCITS T10 Technical Committee for SCSI Storage Interfaces at
http://www.t10.org.

11.   Acknowledgements

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

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