UNH IOL iSCSI CONSORTIUM

Error Recovery Test Suite for iSCSI Targets
Version 2.0

Technical Document

Last modified December 14, 2009

UNH-IOL iSCSI Consortium
InterOperability Laboratory
University of New Hampshire

121 Technology Drive, Suite 2
Durham, NH 03824
Phone: (603) 862-1908
Fax: (603) 862-4181
http://www.iol.unh.edu/consortiums/iscsi

The University of New Hampshire
InterOperability Laboratory

DIGITAL SIGNATURE INFORMATION

This document was created using an Adobe digital signature. A digital signature helps to ensure the authenticity of the document, but only in this digital format. For information on how to verify this document's integrity proceed to the following site:

http://www.iol.unh.edu/certifyDoc/index.html

If the document status still indicates "Validity of author NOT confirmed", then please contact the UNH-IOL to confirm the document's authenticity. To further validate the certificate integrity, Adobe 6.0 should report the following fingerprint information:

MD5 Fingerprint: F6E2 1B99 28AD 0D25 E77E ADE5 479A 1E05
SHA-1 Fingerprint: AD30 8B08 DD3B B2E3 9362 46E9 3427 BE47 1D49 890B

The University of New Hampshire
InterOperability Laboratory

TABLE OF CONTENTS

MODIFICATION RECORD

[1] February 19, 2004 (Version 0.1) DRAFT RELEASE

David Woolf: Initial draft release to draft 20 of the iSCSI standard

[2] December 6, 2004 (Version 0.2) DRAFT RELEASE

David Woolf: Added series of data digest error tests and dropped PDU tests.

[3] October 18, 2007 (Version 1.0) UNRELEASED

David Woolf: Test Suite updated to match final RFC 3720 standard.

[4] December 14, 2009 (Version 2.0) FINAL RELEASE

Patrick MacArthur: Updated test suite to match RFC 5048.
Removed tests #9.1, 15.2
Grouped and renumbered tests:

From	To
#4.1	#4.1.1
#10.1-14.2	#9.1.1-9.5.2
#7.1	#7.1.1
#15.1	#7.2.1
#7.2	#7.2.2
#16.1-17.2	#7.3.1-7.4.2
#7.3	#7.4.3
#18.1-22.2	#7.5.1-7.9.2
#23.1	#10.1

Added Tests #2.3, 2.4, 4.1.2, 4.1.3, 6.2
Modified test #4.2.2: Added reference to RFC 3720 section 10.3.1
Modified tests #2.1, 2.2, 3.2-3.4, 4.1.2, 5.2, 7.1.2, 7.2.2, 9.2.1, 9.4.2, 9.5.1-9.5.2, 10.1: Fixed typographical errors
Modified tests #3.1-3.6, 5.3, 7.1.2, 7.3.1-7.4.2, 7.5.1-7.9.2, 8.1-8.3, 9.1.1-9.4.1, 9.5.2: Clarified test discussion
Modified tests #5.3: Clarified test procedure
Modified tests #8.1-8.3: Clarified test procedure and added reference to RFC 3720 section 6.7
Modified test #6.1: Removed unnecessary explicit requirements for negotiated keys
Modified test #4.2.1, 7.4.3: Clarified observable results

ACKNOWLEDGMENTS

The University of New Hampshire would like to acknowledge the efforts of the following individuals in the development of this test suite.

David Woolf	University of New Hampshire
Patrick MacArthur	University of New Hampshire

INTRODUCTION

Overview

The University of New Hampshire's InterOperability Laboratory (IOL) is an institution designed to improve the interoperability of standards based products by providing an environment where a product can be tested against other implementations of a standard. This particular suite of tests has been developed to help implementers evaluate the Error Recovery functionality of their iSCSI targets.

These tests are designed to determine if an iSCSI product conforms to specifications defined in ***IETF RFC 3720 iSCSI*** (hereafter referred to as the "iSCSI Standard") and ***IETF RFC 5048 iSCSI Corrections and Clarifications*** (hereafter referred to as "iSCSI Corrections and Clarifications"). Successful completion of all tests contained in this suite does not guarantee that the tested device will successfully operate with other iSCSI products. However, when combined with satisfactory operation in the IOL's interoperability test bed, these tests provide a reasonable level of confidence that the Device Under Test (DUT) will function properly in many iSCSI environments.

The tests contained in this document are organized in order to simplify the identification of information related to a test, and to facilitate in the actual testing process. Tests are separated into groups, primarily in order to reduce setup time in the lab environment, however the different groups typically also tend to focus on specific aspects of device functionality. A dot-notated naming system is used to catalog the tests, where the first number always indicates a specific group of tests in the test suite is based. For tests within groups that have subgroups, the second and third numbers indicate the test's subgroup number and test number within that group and subgroup, respectively. For tests within groups that do not have subgroups, the second number indicates the test number within the group. This format allows for the addition of future tests in the appropriate groups without requiring the renumbering of the subsequent tests, as well as the ability to keep some test numbers consistent with previous versions of the test suite.

The test definitions themselves are intended to provide a high-level description of the motivation, resources, procedures, and methodologies specific to each test. Formally, each test description contains the following sections:

Purpose

The purpose is a short statement describing what the test attempts to achieve. The test is written at the functional level.

References

This section specifies all reference material *external* to the test suite, including the specific sub clauses references for the test in question, and any other references that might be helpful in understanding the test methodology and/or test results. External sources may be referenced by a bracketed number (e.g., [1]) when mentioned in the test description. Any other references in the test description that are not indicated in this manner refer to elements within the test suite document itself (e.g., "Appendix 5.A", or "Table 5.1.1-1")

Resource Requirements

The requirements section specifies the software, hardware, and test equipment that will be needed to perform the test. The items contained in this section are special test devices, software that must reside on the DUT, or other facilities which may not be available on all devices.

Last Modification

This specifies the date of the last modification to this test.

Discussion

The discussion covers the assumptions made in the design or implementation of the test as well as known limitations. Other items specific to the test are covered here.

Test Setup

The setup section describes in detail the configuration of the test environment and includes a block diagram for clarification as well as information such as the interconnection of devices, what monitoring equipment should capture, what the generation equipment should send, and any other configuration information vital to carrying out the test. Small changes in the configuration should be included in the test procedure.

Procedure

The procedure section of the test description contains the step-by-step instructions for carrying out the test. It provides a cookbook approach to testing, and will often be interspersed with observable results.

Observable Results

The observable results section lists observables that can be examined by the tester to verify that the DUT is operating properly. When multiple values are possible for an observable, this section provides a short discussion on how to interpret them. Note that complete delineation between the observables in the **Procedure** and **Observable Results** is virtually impossible. As such a careful note should be made of the requirements in both sections. In certain cases, it may be necessary to modify certain steps in the **Procedure** section while doing the actual tests so as to be able to perform the tests. In such cases, the modifications will be noted in the summary report.

Possible Problems

This section provides some clues to look for if the test does not yield the expected results.

REFERENCES

The following documents are referenced in this text:

iSCSI Standard IETF RFC 3720
iSCSI Corrections and Clarifications IETF RFC 5048

ADDITIONAL ACRONYMS AND ABBREVIATIONS

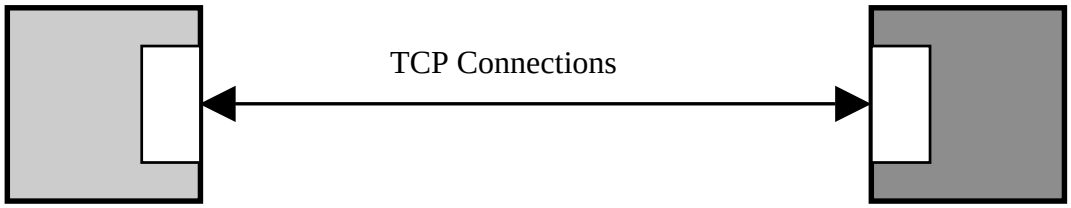
The acronyms and abbreviations defined here supplement the acronyms defined in IETF RFC 3720 section 2.2 and may be used in this document.

Acronym	Definition
DUT	Device Under Test
DDTL	DesiredDataTransferLength
DSL	DataSegmentLength
EDTL	ExpectedDataTransferLength
MRDSL	MaxRecvDataSegmentLength
READ CAP	READ CAPACITY
TMF	Task Management Function

TEST SETUPS

The following test setups are used in this test suite:

Test Setup 1:



Testing Station/ Monitor DUT

The University of New Hampshire
InterOperability Laboratory

GROUP 1: COMMAND RETRY FOR TARGETS

Overview: This group of tests verifies the Command Retry functionality of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #1.1: Inadvertent Retry

Purpose: To see that the DUT properly handles a command that was retried inadvertently.

Reference: iSCSI Standard 3.2.2.1, 6.2.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 24, 2007

Discussion: If initiators, as part of plugging command sequence gaps as described above, inadvertently issue retries for allegiant commands already in progress (i.e., targets did not see the discontinuities in CmdSN ordering), the duplicate commands are silently ignored by targets as specified in section 3.2.2.1.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login and move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a WRITE command with the same CmdSN as the TEST_UNIT_READY.
- Transmit a second WRITE command with a CmdSN of one more than that of the TEST_UNIT_READY.

Observable Results:

- Verify that the DUT silently ignores the duplicate CmdSN, and does not send Reject, R2T, or close the connection.
- Verify that the DUT completes the second WRITE command.

Possible Problems: None.

Test #1.2: Retry after Digest Error

Purpose: To see that the DUT properly handles a command that is being retried after it was discarded due to a Digest Error.

Reference: iSCSI Standard 6.2.1, 6.3, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 24, 2007

Discussion: By resending the same iSCSI command PDU ("retry") in the absence of a command acknowledgement (by way of an ExpCmdSN update) or a response, an initiator attempts to "plug" (what it thinks are) the discontinuities in CmdSN ordering on the target end. Discarded command PDUs, due to digest errors, may have created these discontinuities. When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest- Error and discard the PDU. The CmdSN of the rejected command PDU (if it is a non-immediate command) MUST NOT be considered received by the target (i.e., a command sequence gap must be assumed for the CmdSN), even though the CmdSN of the rejected command PDU may be reliably ascertained.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=Yes, DataDigest=CRC32C.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a WRITE command with a Data Digest error. Once Reject is received from the DUT the Testing Station should retry the original WRITE command. This is accomplished by sending a WRITE command with identical Initiator Task Tag, flags, function names, LUN, CDB, and CmdSN.

Observable Results:

- Verify that the DUT transmits Reject to the WRITE command received with the Data Digest error.
- Verify that the DUT completes the second WRITE command.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable. If the target does not support ImmediateData=Yes, this item is not testable.

The University of New Hampshire
InterOperability Laboratory

GROUP 2: ALLEGIANCE REASSIGNMENT FOR TARGETS

Overview: This group of tests verifies the Task Allegiance Reassignment functionality of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #2.1: Allegiance Reassignment for WRITE Command after Valid Logout

Purpose: To see that, after a Data Digest error, the DUT properly handles a task that is being reassigned after it has had its connection allegiance changed.

Reference: iSCSI Standard 6.2.2, 10.6, 10.14

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 24, 2008

Discussion: By issuing a "task reassign" task management request (Section 10.5.1 Function), the initiator signals its intent to continue an already active command (but with no current connection allegiance) as part of connection recovery. This means that a new connection allegiance is requested for the command, which seeks to associate it to the connection on which the task management request is being issued. Before the allegiance reassignment is attempted for a task, an implicit or explicit Logout with the reason code "remove the connection for recovery" (see section 10.14) MUST be successfully completed for the previous connection to which the task was allegiant.

Test Setup: The DUT and Test Station pair should be able to make 2 TCP connections.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, DataDigest=CRC32C.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a WRITE command.
- The DUT should transmit the first 2 Data-Out PDUs of the command when R2T's are received. The third Data-Out PDU should be transmitted with a Data Digest error. Once Reject is received from the DUT the Testing Station should open a second connection within the session.
- The Testing Station should transmit a Logout Request with the reason code "remove the connection for recovery" on the first connection.
- On the second connection, after the Login Phase is complete, the Testing Station should transmit a Task Management Request with function code TASK REASSIGN (8). The DUT is expected to respond with a Task Management Request with response code 0, Function complete.
- Retransmit the Data-Out PDU that was rejected previously, this time with no Data-Digest error. Transmit all remaining Data-Out PDUs for the command.

Observable Results:

- Verify that the DUT transmits SCSI Response of status Good.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable. The target may indicate that it does not support allegiance reassignment either by transmitting a Logout Response of reason code "connection recovery not supported" (2) on the first connection, or by transmitting a Task Management Response of reason code "Allegiance reassignment not supported" (4) on the second connection. In either of these cases the item is not testable.

Test #2.2: Allegiance Reassignment Attempt for WRITE Command without Logout

Purpose: To see that the DUT properly handles a command that is being reassigned before its connection allegiance has been changed.

Reference: iSCSI Standard 6.2.2

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 27, 2007

Discussion: By issuing a "task reassign" task management request (Section 10.5.1 Function), the initiator signals its intent to continue an already active command (but with no current connection allegiance) as part of connection recovery. This means that a new connection allegiance is requested for the command, which seeks to associate it to the connection on which the task management request is being issued. Before the allegiance reassignment is attempted for a task, an implicit or explicit Logout with the reason code "remove the connection for recovery" (see section 10.14) MUST be successfully completed for the previous connection to which the task was allegiant. If allegiance reassignment is supported by the target, but the task is still allegiant to a different connection, or a successful recovery Logout of the previously allegiant connection was not performed, the target MUST respond with a Task Management response code of "Task still allegiant".

Test Setup: The DUT and Test Station pair should be able to make 2 TCP connections.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, DataDigest=CRC32C.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a WRITE command.
- The DUT should transmit the first 2 Data-Out PDUs of the command when R2T's are received. The third Data-Out PDU should be transmitted with a Data Digest error. Once Reject is received from the DUT the Testing Station should open a second connection within the session.
- On the second connection, after the Login Phase is complete, the Testing Station should transmit a Task Management Request with function code TASK REASSIGN (8).

Observable Results:

- Verify that the DUT transmits Task Management Response with response code 3, Task still allegiant.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #2.3: Allegiance Reassignment for READ Command with Valid Logout

Purpose: To verify that when a connection is reassigned for a task which has not lost connection allegiance, the proper Task Management Response is transmitted.

Reference: iSCSI Standard 6.2.2, 10.5.1, 10.6.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: February 18, 2009

Discussion: By issuing a "task reassign" task management request, the initiator signals its intent to continue an already active command (but with no current connection allegiance) as part of connection recovery. This means that a new connection allegiance is requested for the command, which seeks to associate it to the connection on which the task management request is being issued. Before the allegiance reassignment is attempted for a task, an implicit or explicit Logout with the reason code "remove the connection for recovery" MUST be successfully completed for the previous connection to which the task was allegiant.

Test Setup: The DUT and Test Station pair should be able to make multiple TCP connections.

Procedure:

- Start 2 connections from the Testing Station to the iSCSI target being tested.
- On each connection transmit the initial login request to the DUT. This should be the initial request in a Normal session (i.e. not a Discovery session).
- On each connection negotiate ErrorRecoveryLevel=2.
- On each connection proceed through the Login Phase and in to Full Feature Phase operation.
- On each connection transmit a SCSI-INQUIRY to the DUT. Wait for a response and data from the DUT
- On each connection transmit a TEST-UNIT READY to the DUT. Wait for a response from the DUT
- On each connection transmit a READ-CAP to the DUT. Wait for response and data from the DUT
- On one connection, transmit a READ Command to the DUT.
- After the first Data-in PDU is received, transmit a Logout Request with the reason code "remove the connection for recovery". Wait for a Logout Response from the DUT.
- On the second connection, transmit an immediate Task Management Command with Function Code 8.

Observable Results:

- Verify that the DUT responds using a Task Management response with a valid response code on the same connection that the Task Management Request was sent on.

Possible Problems: If ErrorRecoveryLevel < 2, this item cannot be tested. To indicate that it does not support Task Reassignment the DUT should reply to the Task Management Request with a Task Management response code 4, Task allegiance reassignment not supported.

Test #2.4: Allegiance Reassignment with Implicit Logout

Purpose: To verify that when a connection is dropped, connection allegiance may be assigned to a new connection, and that the corresponding task reassign is only received by the target after the original connection is logged out.

Reference: iSCSI Standard 6.2.2, 10.5.1, 10.6.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: By issuing a "task reassign" task management request, the initiator signals its intent to continue an already active command (but with no current connection allegiance) as part of connection recovery. This means that a new connection allegiance is requested for the command, which seeks to associate it to the connection on which the task management request is being issued. Before the allegiance reassignment is attempted for a task, an implicit or explicit Logout with the reason code "remove the connection for recovery" MUST be successfully completed for the previous connection to which the task was allegiant.

Test Setup: The DUT and Test Station pair should be able to make multiple TCP connections.

Procedure:

- Start 2 connections from the Testing Station to the iSCSI target being tested.
- On each connection transmit the initial login request to the DUT. This should be the initial request in a Normal session (i.e. not a Discovery session). On each connection negotiate ErrorRecoveryLevel=2.
- On each connection proceed through the Login Phase and in to Full Feature Phase operation.
- On each connection transmit a SCSI-INQUIRY to the DUT. Wait for a response and data from the DUT
- On each connection transmit a TEST-UNIT READY to the DUT. Wait for a response from the DUT
- On each connection transmit a READ-CAP to the DUT. Wait for response and data from the DUT
- On one connection, transmit a READ Command to the DUT. After the first Data-in PDU is received, drop the connection. This is an implicit Logout Request.
- On the second connection, transmit an immediate Task Management Command with Function Code 8.

Observable Results:

- Verify that the DUT transmits a Task Management Response with response code 0 and begins transmitting Data-in PDU for the previous READ Command. Other task management response reason codes are permissible. If the target does not respond with response code 0, then it cannot be expected to resume operations on the second connection.

Possible Problems: If ErrorRecoveryLevel < 2, this item cannot be tested. To indicate that it does not support Task Reassignment the DUT should reply to the Task Management Request with a Task Management response code 4, Task allegiance reassignment not supported.

The University of New Hampshire
InterOperability Laboratory

GROUP 3: SNACK FOR TARGETS

Overview: This group of tests verifies the SNACK functionality of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #3.1: R2T SNACK Support

Purpose: To see that the DUT properly handles SNACK type 0.

Reference: iSCSI Standard 10.16

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: The SNACK is used by the initiator to request the retransmission of numbered-responses, data, or R2T PDUs from the target. The SNACK request indicates the numbered-responses or data "runs" whose retransmission is requested by the target, where the run starts with the first StatSN, DataSN, or R2TSN whose retransmission is requested and indicates the number of Status, DataSN, or R2TSN requested including the first. The numbered-response(s) or R2T(s), requested by a SNACK, MUST be delivered as exact replicas of the ones that the target transmitted originally except for the fields ExpCmdSN, MaxCmdSN, and ExpDataSN, which MUST carry the current values. If the implementation supports ErrorRecoveryLevel greater than zero, it MUST support all SNACK types.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0.
- The Testing Station should move into the Full Feature Phase.
- The testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command.
- The Testing Station should transmit the first 2 Data-Out PDUs of the command when R2T's are received.
- Upon receiving the 3rd R2T the Testing Station should transmit a SNACK of type 0 with BegRun and RunLength indicating the 3rd received R2T.
- When the DUT retransmits the requested R2T complete the write command by transmitting the final Data-Out PDU with the F bit set to 1.

Observable Results:

- Verify that the DUT retransmits the requested R2T.
- Verify that the DUT transmits a SCSI Response of Status Good once the command is complete.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #3.2: Data SNACK Support for Single Data-In PDU

Purpose: To see that the DUT properly handles SNACK type 0.

Reference: iSCSI Standard 10.16

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: The SNACK is used by the initiator to request the retransmission of numbered-responses, data, or R2T PDUs from the target. The SNACK request indicates the numbered-responses or data "runs" whose retransmission is requested by the target, where the run starts with the first StatSN, DataSN, or R2TSN whose retransmission is requested and indicates the number of Status, DataSN, or R2TSN requested including the first. The numbered Data-In PDUs, requested by a Data SNACK MUST be delivered as exact replicas of the ones that the target transmitted originally except for the fields ExpCmdSN, and MaxCmdSN, which MUST carry the current values and except for resegmentation.If the implementation supports ErrorRecoveryLevel greater than zero, it MUST support all SNACK types.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=512.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a READ command for 2048 bytes.
- The DUT should transmit 4 Data-In PDUs.
- Upon receiving the 3rd Data-In PDU the Testing Station should transmit a SNACK of type 0 with BegRun and RunLength indicating the 3rd received Data-In PDU.

Observable Results:

- Verify that the DUT retransmits the requested Data-In.
- Verify that the DUT transmits a SCSI Response of Status Good once the command is complete.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #3.3: Data SNACK Support for Data Run

Purpose: To see that the DUT properly handles SNACK type 0 when a run of PDUs is requested.

Reference: iSCSI Standard 10.16

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: The SNACK is used by the initiator to request the retransmission of numbered-responses, data, or R2T PDUs from the target. The SNACK request indicates the numbered-responses or data "runs" whose retransmission is requested by the target, where the run starts with the first StatSN, DataSN, or R2TSN whose retransmission is requested and indicates the number of Status, DataSN, or R2TSN requested including the first. The numbered Data-In PDUs, requested by a Data SNACK MUST be delivered as exact replicas of the ones that the target transmitted originally except for the fields ExpCmdSN, and MaxCmdSN, which MUST carry the current values and except for resegmentation. If the implementation supports ErrorRecoveryLevel greater than zero, it MUST support all SNACK types.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=512.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a READ command for 2048 bytes.
- The DUT should transmit 4 Data-In PDU's.
- Upon receiving the 3rd Data-In PDU the Testing Station should transmit a SNACK of type 0 with BegRun and RunLength indicating all 3 received Data-In PDUs.

Observable Results:

- Verify that the DUT retransmits the requested Data-In PDUs.
- Verify that the DUT transmits a SCSI Response of Status Good once the command is complete.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #3.4: Data SNACK Support for Entire Data Sequence

Purpose: To see that the DUT properly handles SNACK type 0 when a run of PDUs is requested.

Reference: iSCSI Standard 10.16

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: The SNACK is used by the initiator to request the retransmission of numbered-responses, data, or R2T PDUs from the target. The SNACK request indicates the numbered-responses or data "runs" whose retransmission is requested by the target, where the run starts with the first StatSN, DataSN, or R2TSN whose retransmission is requested and indicates the number of Status, DataSN, or R2TSN requested including the first. 0 has special meaning when used as a starting number and length: When used in RunLength, it means all PDUs starting with the initial, and when used in both BegRun and RunLength, it means all unacknowledged PDUs. The numbered Data-In PDUs, requested by a Data SNACK MUST be delivered as exact replicas of the ones that the target transmitted originally except for the fields ExpCmdSN, and MaxCmdSN, which MUST carry the current values and except for resegmentation. If the implementation supports ErrorRecoveryLevel greater than zero, it MUST support all SNACK types.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=512.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Transmit a READ command for 2048 bytes.
- The DUT should transmit 4 Data-In PDU's.
- Upon receiving the 4th Data-In PDU the Testing Station should transmit a SNACK of type 0 with BegRun and RunLength set to 0.

Observable Results:

- Verify that the DUT retransmits all 4 of the requested Data-In PDUs.
- Verify that the DUT transmits a SCSI Response of Status Good once the command is complete.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #3.5: Status SNACK Support for SCSI Response

Purpose: To see that the DUT properly handles a SNACK type 1 request.

Reference: iSCSI Standard 10.16.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: The SNACK is used by the initiator to request the retransmission of numbered-responses, data, or R2T PDUs from the target. The SNACK request indicates the numbered-responses or data "runs" whose retransmission is requested by the target, where the run starts with the first StatSN, DataSN, or R2TSN whose retransmission is requested and indicates the number of Status, DataSN, or R2TSN requested including the first. The numbered-response(s) or R2T(s), requested by a SNACK, MUST be delivered as exact replicas of the ones that the target transmitted originally except for the fields ExpCmdSN, MaxCmdSN, and ExpDataSN, which MUST carry the current values. If the implementation supports ErrorRecoveryLevel greater than zero, it MUST support all SNACK types.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=512.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Perform 3 consecutive WRITE commands.
- Once status has been received for all 3 WRITE commands, transmit a SNACK of type 1 with BegRun and RunLength indicating status is requested for the last received Status.

Observable Results:

- Verify that the DUT retransmits the requested Response PDU.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #3.6: Status SNACK Support for Run of Responses

Purpose: To see that the DUT properly handles a SNACK type 1 request for a run of numbered responses.

Reference: iSCSI Standard 10.16.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: The SNACK is used by the initiator to request the retransmission of numbered-responses, data, or R2T PDUs from the target. The SNACK request indicates the numbered-responses or data "runs" whose retransmission is requested by the target, where the run starts with the first StatSN, DataSN, or R2TSN whose retransmission is requested and indicates the number of Status, DataSN, or R2TSN requested including the first. The numbered-response(s) or R2T(s), requested by a SNACK, MUST be delivered as exact replicas of the ones that the target transmitted originally except for the fields ExpCmdSN, MaxCmdSN, and ExpDataSN, which MUST carry the current values. If the implementation supports ErrorRecoveryLevel greater than zero, it MUST support all SNACK types.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=512.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- Perform 3 consecutive WRITE commands.
- Once status has been received for all 3 WRITE commands, transmit a SNACK of type 1 with BegRun and RunLength both of 0.

Observable Results:

- Verify that the DUT retransmits all 4 of the requested Response PDUs.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #3.7: Resegmentation SNACK Support

Purpose: To see that the DUT properly handles a SNACK type 3 request when resegmentation is necessary.

Reference: iSCSI Standard 10.16.1, 10.16.3

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 29, 2007

Discussion: With R-Data SNACK, the initiator indicates that it discards all the unacknowledged data and expects the target to resend it. It also expects resegmentation. In this case, the retransmitted Data-In PDUs MAY be different from the ones originally sent in order to reflect changes in MaxRecvDataSegmentLength. Their DataSN starts with the BegRun of the last DataACK received by the target if any was received; otherwise it starts with 0 and is increased by 1 for each resent Data-In PDU. A target that has received a R-Data SNACK MUST return a SCSI Response that contains a copy of the SNACK Tag field from the R-Data SNACK in the SCSI Response SNACK Tag field as its last or only Response. For example, if it has already sent a response containing another value in the SNACK Tag field or had the status included in the last Data-In PDU, it must send a new SCSI Response PDU. If a target sends more than one SCSI Response PDU due to this rule, all SCSI responses must carry the same StatSN (see Section 10.4.4 SNACK Tag). If an initiator attempts to recover a lost SCSI Response (with a Status-SNACK, see Section 10.16.1 Type) when more than one response has been sent, the target will send the SCSI Response with the latest content known to the target, including the last SNACK Tag for the command.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=1024.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a READ command for 4096 bytes.
- Once status has been received for the READ command, the Testing Station should send a Text Request declaring a new value of MaxRecvDataSegmentLength=512. Wait for a valid Text Response.
- The Testing Station should transmit a SNACK of type 3 with BegRun and RunLength both of 0.

Observable Results:

- Verify that the DUT retransmits all of the Data for the READ command using the new MaxRecvDataSegment Length.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

The University of New Hampshire
InterOperability Laboratory

GROUP 4: REJECT FOR TARGETS

Overview: This group of tests verifies the Reject functionality of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #4.1.1: Usage of Reject for Data-Out PDU

Purpose: To see that if the DUT chooses to issue a Reject PDU for an errored Non-Command PDU, it also transmits SCSI Response when the command is complete.

Reference: iSCSI Standard 6.3, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 24, 2008

Discussion: Targets MUST NOT implicitly terminate an active task by sending a Reject PDU for any PDU exchanged during the life of the task. If the target decides to terminate the task, a Response PDU (SCSI, Text, Task, etc.) must be returned by the target to conclude the task.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes.
- Once R2T is received the Testing Station should transmit a Data-Out PDU with a payload-digest error.

Observable Results:

- Verify that the DUT transmits a Reject PDU, and that it also transmits a SCSI Response PDU when the command is complete, and not before a Data-Out with the F bit set is received.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #4.1.2: Usage of Reject for SNACK PDU

Purpose: To see that an iSCSI target properly formats an iSCSI Reject PDU.

Reference: iSCSI Standard 6.3, 10.17, 10.17.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: Reject is used to indicate an iSCSI error condition (protocol, unsupported option, etc.). In all the cases in which a pre-instantiated SCSI task is terminated because of the reject, the target MUST issue a proper SCSI command response with CHECK CONDITION as described in Section 9.4.3 Response. In these cases in which a status for the SCSI task was already sent before the reject, no additional status is required. If the error is detected while data from the initiator is still expected (i.e., the command PDU did not contain all the data and the target has not received a Data-out PDU with the Final bit set to 1 for the unsolicited data, if any, and all outstanding R2Ts, if any), the target MUST wait until it receives the last expected Data-out PDUs with the F bit set to 1 before sending the Response PDU.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Start a connection from the Testing Station to the iSCSI target being tested.
- Negotiate the following parameters: ImmediateData=No; InitialR2T=Yes, ErrorRecoveryLevel > 0.
- Declare a MaxRecvDataSegmentLength of 1024.
- Perform a standard login and proceed to the Full Feature Phase.
- Issue a SCSI-INQUIRY, TEST-UNIT-READY and READ-CAP to the DUT. Wait for response data and status.
- Issue a READ command to the DUT.
- Wait for a Data-In PDU from the DUT.
- Transmit a DataACK SNACK PDU with an invalid Initiator Task Tag which is the same as that of the READ command. The DUT should transmit a Reject.
- Wait for Data-In PDUs and SCSI Response Data to complete the command.

Observable Results:

- Verify that if the DUT issues a Reject PDU it is formatted correctly.
- Verify that the StatSN, ExpCmdSN, and MaxCmdSN are not those of the rejected command, but are incremented as they usually would have been if the SCSI Command PDU has not been rejected. The only field that must be incremented is StatSN. It is expected that the StatSN in the Reject will be the same as the StatSN in the previous R2T. It is expected that the StatSN of the SCSI Response PDU will be one more than the StatSN of the Reject PDU. None of the fields should decrease in value to match the values of the Rejected PDU.
- Verify that the DUT includes a copy of the rejected PDU header in the Reject.

Possible Problems: The DUT must support ErrorRecoveryLevel > 0 in order to perform this test.

Test #4.2.1: Usage of Reject for WRITE Command PDU

Purpose: To see that if the DUT chooses to issue a Reject PDU for an errored Command PDU, it does not transmit any response.

Reference: iSCSI Standard 6.3

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: Targets MUST NOT implicitly terminate an active task by sending a Reject PDU for any PDU exchanged during the life of the task. If the target decides to terminate the task, a Response PDU (SCSI, Text, Task, etc.) must be returned by the target to conclude the task. The CmdSN of the rejected command PDU (if it is a non-immediate command) MUST NOT be considered received by the target (i.e., a command sequence gap must be assumed for the CmdSN), even though the CmdSN of the rejected command PDU may be reliably ascertained.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=Yes.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes with ImmediateData attached. There should be a data-digest error.
- Once the Reject PDU is received, transmit a second WRITE command with the same CmdSN.

Observable Results:

- Verify that the DUT transmits a Reject PDU in response to the first WRITE command. Verify that the DUT does not transmit a SCSI Response PDU or any other response such as R2T.
- Verify that the DUT responds to the second received WRITE command properly, not ignoring it as if it were a duplicate CmdSN.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #4.2.2: Usage of Reject for READ Command PDU

Purpose: To see that if the DUT chooses to issue a Reject PDU for an errored Command PDU, it does not transmit any response.

Reference: iSCSI Standard 6.3, 10.3.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: Targets MUST NOT implicitly terminate an active task by sending a Reject PDU for any PDU exchanged during the life of the task. If the target decides to terminate the task, a Response PDU (SCSI, Text, Task, etc.) must be returned by the target to conclude the task.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=Yes.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a READ command for 4096 bytes. The R bit should not be set.

Observable Results:

- Verify that if the DUT transmits a Reject PDU, it also does not transmit a SCSI Response PDU.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

The University of New Hampshire
InterOperability Laboratory

GROUP 5: TERMINATION OF TASKS FOR TARGETS

Overview: This group of tests verifies that iSCSI targets terminate tasks when a connection is not properly closed for recovery, as defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #5.1: Termination of Tasks During Connection Logout without Recovery

Purpose: To see that the DUT terminates tasks under the necessary conditions.

Reference: iSCSI Standard 6.5

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 29, 2007

Discussion: A target implicitly terminates the active tasks due to iSCSI protocol dynamics when a connection is implicitly or explicitly logged out with the reason code of "Close the connection" and there are active tasks allegiant to that connection.

Test Setup: The DUT and Test Station pair should be able to make multiple TCP connections.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes.
- The Testing Station should move into the Full Feature Phase. Open a second connection to the DUT and move into Full Feature Phase.
- On each connection the Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes with ImmediateData attached.
- Once the R2T PDU is received, the Testing Station should transmit a Logout Request PDU with reason code of 'Close the Connection'.
- On the second connection transmit a Task Management Request to the DUT of Function Code 8 TASK REASSIGN.

Observable Results:

- Verify that the DUT transmits a proper Logout Response.
- Verify that the DUT does not attempt to fulfill the Task Management Request, but rather responds with a Task Management Response indicating that the task could not be reassigned, such as Response Code 1 Task does not exist.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #5.2: Termination of Tasks After Timeout

Purpose: To see that the DUT terminates tasks under the necessary conditions.

Reference: iSCSI Standard 6.5

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 27, 2008

Discussion: A target implicitly terminates the active tasks due to iSCSI protocol dynamics when a connection fails and eventually the connection state times out and there are active tasks allegiant to that connection.

Test Setup: The DUT and Test Station pair should be able to make multiple TCP connections.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes.
- The Testing Station should move into the Full Feature Phase. Open a second connection to the DUT and move into Full Feature Phase.
- On each connection the Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes with ImmediateData attached.
- Once the R2T PDU is received, the Testing Station should drop the connection.
- On the second connection wait 2 minutes and then transmit a Task Management Request to the DUT of Function Code 8 TASK REASSIGN.

Observable Results:

- Verify that the DUT does not attempt to fulfill the Task Management Request, but rather responds with a Task Management Response indicating that the task could not be reassigned, such as Response Code 1 Task does not exist.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #5.3: Termination of Tasks After DefaultTime2Retain Period

Purpose: To see that the DUT terminates tasks under the necessary conditions.

Reference: iSCSI Standard 6.5

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: December 8, 2009

Discussion: A target implicitly terminates the active tasks due to iSCSI protocol dynamics when a successful Logout with the reason code of "remove the connection for recovery" is performed while there are active tasks allegiant to that connection, and those tasks eventually time out after the Time2Wait and Time2Retain periods without allegiance reassignment.

Test Setup: The DUT and Test Station pair should be able to make multiple TCP connections.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes, DefaultTime2Wait=2, DefaultTime2Retain=5.
- The Testing Station should move into the Full Feature Phase. Open a second connection to the DUT and move into Full Feature Phase.
- On each connection the Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes with ImmediateData attached.
- Once the R2T PDU is received, the Testing Station should transmit a Logout Request with reason code "Remove Connection for Recovery'.
- Receive the Logout Response
- On the second connection wait at least 8 seconds and then transmit a Task Management Request to the DUT of Function Code 8 TASK REASSIGN.

Observable Results:

- Verify that the DUT does not attempt to fulfill the Task Management Request, but rather responds with a Task Management Response indicating that the task could not be reassigned, such as Response Code 1 Task does not exist.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

Test #5.4: Termination of Tasks After Session Closed

Purpose: To see that the DUT terminates tasks under the necessary conditions.

Reference: iSCSI Standard 6.5

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 29, 2007

Discussion: A target implicitly terminates the active tasks due to iSCSI protocol dynamics when a connection is implicitly or explicitly logged out with the reason code of "Close the session" and there are active tasks in that session.

Test Setup: The DUT and Test Station pair should be able to make multiple TCP connections.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes, DefaultTime2Wait=2, DefaultTime2Retain=5.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes with ImmediateData attached.
- Once the R2T PDU is received, the Testing Station should transmit a Logout Request with reason code 'Close the Session'.
- Once the session is closed the Testing Station should open a new session. During the Login Phase negotiate ErrorRecoveryLevel>0. Once in the Full Feature Phase the Testing Station should transmit a Task Management Request to the DUT of Function Code 8 TASK REASSIGN.

Observable Results:

- Verify that the DUT does not attempt to fulfill the Task Management Request, but rather responds with a Task Management Response indicating that the task could not be reassigned, such as Response Code 1 Task does not exist.

Possible Problems: If the target does not support ErrorRecoveryLevel>0 this item is not testable. If the target chooses to escalate this error to Session Recovery by closing the connection, this item is not testable.

The University of New Hampshire
InterOperability Laboratory

GROUP 6: FORMAT ERROR DETECTION FOR TARGETS

Overview: This group of tests verifies the format error recovery of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #6.1: Format Error (TotalAHSLength)

Purpose: To see that the DUT properly identifies and reacts to a format error.

Reference: iSCSI Standard 6.6

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 29, 2007

Discussion: The following two explicit violations of PDU layout rules are format errors: a) Illegal contents of any PDU header field except the Opcode (legal values are specified in Section 10 iSCSI PDU Formats) b) Inconsistent field contents (consistent field contents are specified in Section 10 iSCSI PDU Formats). Format errors indicate a major implementation flaw in one of the parties. When a target or an initiator receives an iSCSI PDU with a format error, it MUST immediately terminate all transport connections in the session either with a connection close or with a connection reset and escalate the format error to session recovery.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate ErrorRecoveryLevel=2 if possible.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command with the AHSlength field set to a non zero value, but no AHS field in the PDU.

Observable Results:

- Verify that the DUT does not respond to the WRITE command as normal, but instead terminates the connection.

Possible Problems: None.

Test #6.2: Format Error (DataSegmentLength)

Purpose: To see that the DUT properly identifies and reacts to a format error.

Reference: iSCSI Standard 6.6

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: July 10, 2009

Discussion: The following two explicit violations of PDU layout rules are format errors: a) Illegal contents of any PDU header field except the Opcode (legal values are specified in Section 10 iSCSI PDU Formats) b) Inconsistent field contents (consistent field contents are specified in Section 10 iSCSI PDU Formats). Format errors indicate a major implementation flaw in one of the parties. When a target or an initiator receives an iSCSI PDU with a format error, it MUST immediately terminate all transport connections in the session either with a connection close or with a connection reset and escalate the format error to session recovery.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command with the DataSegmentLength field set to a non zero value, but no immediate data in the PDU.

Observable Results:

- Verify that the DUT does not respond to the WRITE command as normal, but instead terminates the connection.

Possible Problems: None.

The University of New Hampshire
InterOperability Laboratory

GROUP 7: DIGEST ERROR TESTS FOR TARGETS

Overview: This group of tests verifies the digest error recovery of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #7.1.1: Header Digest Error

Purpose: To see that the DUT properly identifies and reacts to a received header digest error.

Reference: iSCSI Standard 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: August 29, 2007

Discussion: When a target or an initiator receives any iSCSI PDU, with a header digest error, it MUST either discard the header and all data up to the beginning of a later PDU or close the connection.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=Yes, InitialR2T=No.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command with immediate data attached, the F bit set to 1, and a header digest error.
- Transmit a second valid WRITE command with a new CmdSN and a new InitiatorTaskTag.

Observable Results:

- Verify that the DUT either ignores the first received WRITE command, and responds only to the second received WRITE command, or closes the connection and starts Session Recovery.

Possible Problems: None.

Test #7.2.1: Data Digest Error on Immediate Command with Immediate Data

Purpose: To see that the DUT properly handle a data digest error on an immediate command with immediate data attached.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: When a target receives any PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. No further action is necessary for targets if the discarded PDU is a non-data PDU, including immediate data in a command PDU.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit an immediate WRITE command to the DUT to with immediate data attached. This PDU should have a payload digest error. The DUT is expected to respond with a Reject PDU.
- After receiving the Reject PDU the Testing Station should retry the immediate WRITE command, sending an identical copy of the original command.

Observable Results:

- Verify that the DUT transmits Reject to the received data digest error.
- Verify that the retried command ends with status GOOD.

Possible Problems: None.

Test #7.2.2: Data Digest Error on Non-immediate Command PDU with Immediate Data

Purpose: To see that the DUT properly identifies and reacts to a received payload digest error.

Reference: iSCSI Standard 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. No further action is necessary for targets if the discarded PDU is a non-data PDU. In case of immediate data being present on a discarded command, the immediate data is implicitly recovered when the task is retried (see section 6.2.1), followed by the entire data transfer for the task.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=Yes, InitialR2T=No.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command with immediate data attached, the F bit set to 1, and a data digest error.
- Transmit a second valid WRITE command with a new CmdSN and a new InitiatorTaskTag.

Observable Results:

- Verify that the DUT transmit a Reject PDU with reason code of Data-Digest-Error, and then takes no further action to recover the PDU.
- Verify that the DUT responds to the second received WRITE command, or closes the connection and starts Session Recovery.

Possible Problems: None.

Test #7.3.1: Data Digest Error on Unsolicited Data when F=0

Purpose: To see that the DUT properly handles a data digest error on an Unsolicited data PDU.

Reference: iSCSI Standard 6.1.4.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. If the discarded PDU is a solicited or unsolicited iSCSI data PDU the target MUST do one of the following a) Request retransmission with a recovery R2T. b) Terminate the task with a response PDU with a CHECK CONDITION Status and an iSCSI Condition of "protocol service CRC error". If the target chooses to implement this option, it MUST wait to receive all the data (signaled by a Data PDU with the final bit set for all outstanding R2Ts) before sending the response PDU. A task management command (such as an abort task) from the initiator during this wait may also conclude the task.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=No. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command to the DUT, followed by 4 Data-Out PDUs. The first Data-Out PDU should have a data digest error. The DUT is expected to transmit a Reject PDU.

Observable Results:

- Verify that the DUT either transmits a Recovery R2T, or waits for the final Data-Out PDU and then terminates the task with status CHECK CONDITION.

Possible Problems: None.

Test #7.3.2: Data Digest Error on Unsolicited Data when F=1

Purpose: To see that the DUT properly handles a data digest error on an Unsolicited data PDU.

Reference: iSCSI Standard 6.1.4.1, 6.2 , 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. If the discarded PDU is a solicited or unsolicited iSCSI data PDU and is the final Data-Out PDU of a command, the target MUST request retransmission with a recovery R2T. If the rejected PDU is the final Data-Out PDU of a command, than the target cannot terminate the task. If the target does not transmit a Recovery R2T, it will need to wait for the initiator to attempt recovery actions.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=No. Negotiate ErrorRecoveryLevel>0.
- The testing station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command to the DUT, followed by 4 Data-Out PDUs. The fourth Data-Out PDU should have a data digest error. The DUT is expected to transmit a Reject PDU.

Observable Results:

- Verify that the DUT transmits a Recovery R2T.

Possible Problems: None.

Test #7.4.1: Data Digest Error on Solicited Data (First in Sequence)

Purpose: To see that the DUT properly handles a data digest error on a solicited data PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. If the discarded PDU is a solicited or unsolicited iSCSI data PDU the target MUST do one of the following a) Request retransmission with a recovery R2T. b) Terminate the task with a response PDU with a CHECK CONDITION Status and an iSCSI Condition of "protocol service CRC error". If the target chooses to implement this option, it MUST wait to receive all the data (signaled by a Data PDU with the final bit set for all outstanding R2Ts) before sending the response PDU. A task management command (such as an abort task) from the initiator during this wait may also conclude the task.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command to the DUT, then wait for R2T.
- Once R2T is received from the DUT, the Testing Station should transmit Data-Out PDUs. The first Data-Out PDU should have a data digest error. The DUT is expected to transmit a Reject PDU.

Observable Results:

- Verify that the DUT either transmits a Recovery R2T, or waits for the final Data-Out PDU and then terminates the task with status CHECK CONDITION.

Possible Problems: None.

Test #7.4.2: Data Digest Error on Solicited Data (Last in Sequence)

Purpose: To see that the DUT properly handles a data digest error on a solicited data PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. If the discarded PDU is a solicited or unsolicited iSCSI data PDU and is the final Data-Out PDU of a command, the target MUST request retransmission with a recovery R2T. If the rejected PDU is the final Data-Out PDU of a command, than the target cannot terminate the task. If the target does not transmit a Recovery R2T, it will need to wait for the initiator to attempt recovery actions.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command to the DUT, then wait for R2T.
- Once R2T is received from the DUT, the Testing Station should transmit Data-Out PDUs. The final Data-Out PDU should have a data digest error. The DUT is expected to transmit a Reject PDU.

Observable Results:

- Verify that the DUT transmits a Recovery R2T.

Possible Problems: None.

Test #7.4.3: Data Digest Error on Solicited Data (Middle of Sequence)

Purpose: To see that the DUT properly identifies and reacts to a received data digest error.

Reference: iSCSI Standard 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: When a target receives any iSCSI PDU with a payload digest error, it MUST answer with a Reject PDU with a reason code of Data-Digest-Error and discard the PDU. If the discarded PDU is a solicited or unsolicited iSCSI data PDU the target MUST do one of the following a) Request retransmission with a recovery R2T. b) Terminate the task with a response PDU with a CHECK CONDITION Status and an iSCSI Condition of "protocol service CRC error". If the target chooses to implement this option, it MUST wait to receive all the data (signaled by a Data PDU with the final bit set for all outstanding R2Ts) before sending the response PDU. A task management command (such as an abort task) from the initiator during this wait may also conclude the task.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes, DefaultTime2Wait=2, DefaultTime2Retain=5.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command.
- Once R2T is received from the DUT the Testing Station should start sending Data-Out PDUs to satisfy the R2T. One of the Data-Out PDUs sent should have a Data-Digest-Error. This should not be the final PDU in the sequence (i.e. does not have the F bit set).
- Transmit a second valid WRITE command with a new CmdSN and a new InitiatorTaskTag.

Observable Results:

- Verify that the DUT transmit a Reject PDU with reason code of Data-Digest-Error, and then takes no further action to recover the PDU.
- Verify that the DUT either transmits a Recovery R2T or sends status of CHECK CONDITION. If the DUT chooses to send status of CHECK CONDITION, verify that it waits until the final Data-Out PDU is received.

Possible Problems: None.

Test #7.5.1: Data Digest Error on Data-In when F=0

Purpose: To see that the DUT properly handles the recovery actions of an initiator detecting a data digest error on a Data-In PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: December 8, 2009

Discussion: At the Initiator, a Data-In PDU with a payload digest error is discarded. The Initiator will then either request retransmission with SNACK or abort the task. The target then has the option of retransmitting the PDU or transmitting SNACK Reject.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit an READ command to the DUT, then wait for Data-In PDUs.
- Once the Testing Station starts receiving Data-Ins, it should simulate a Data Digest Error on a Data-In PDU with F=0. The Testing Station should transmit SNACK for the 'dropped' PDU.

Observable Results:

- Verify that the DUT either retransmits the PDU or transmits SNACK Reject.

Possible Problems: None.

Test #7.5.2: Data Digest Error on Data-In when F=1

Purpose: To see that the DUT properly handles the recovery actions of an initiator detecting a data digest error on a Data-In PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 4, 2007

Discussion: At the Initiator, a Data-In PDU with a payload digest error is discarded. The Initiator will then either request retransmission with SNACK or abort the task. The target then has the option of retransmitting the PDU or transmitting SNACK Reject.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a READ command to the DUT, then wait for Data-In PDUs.
- Once the Testing Station starts receiving Data-Ins, it should simulate a Data Digest Error on a Data-In PDU with F=1. The Testing Station should transmit SNACK for the 'dropped' PDU.

Observable Results:

- Verify that the DUT either retransmits the PDU or transmits SNACK Reject.

Possible Problems: None.

Test #7.6.1: Data Digest Error on NOP-In

Purpose: To see that the DUT properly handles the recovery actions of an initiator detecting a data digest error on a NOP-In PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the Initiator, any PDU with a payload digest error is discarded. If the discarded PDU is a response PDU, the Initiator MUST do one of the following: request retransmission with SNACK, logout the connection for recovery and continue the tasks on a different connection instance as described in Section 6.2 Retry and Reassign in Recovery, or logout to close the connection. The target then has the option of retransmitting the PDU or transmitting SNACK Reject.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a NOP-Out ping to the DUT, then wait for NOP-In response.
- Once the Testing Station receives the NOP-In, it should simulate a Data Digest Error on that NOP-In. The Testing Station should transmit SNACK for the 'dropped' PDU.

Observable Results:

- Verify that the DUT either retransmits the PDU or transmits SNACK Reject.

Possible Problems: None.

Test #7.6.2: Data Digest Error on Immediate NOP-In

Purpose: To see that the DUT properly handles the recovery actions of an initiator detecting a data digest error on a NOP-In PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 5, 2007

Discussion: At the Initiator, any PDU with a payload digest error is discarded. If the discarded PDU is a response PDU, the Initiator MUST do one of the following: request retransmission with SNACK, logout the connection for recovery and continue the tasks on a different connection instance as described in Section 6.2 Retry and Reassign in Recovery, or logout to close the connection. The target then has the option of retransmitting the PDU or transmitting SNACK Reject.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit an immediate NOP-Out ping to the DUT, then wait for NOP-In response.
- Once the Testing Station receives the NOP-In, it should simulate a Data Digest Error on that NOP-In. The Testing Station should transmit SNACK for the 'dropped' PDU.

Observable Results:

- Verify that the DUT either retransmits the PDU or transmits SNACK Reject.

Possible Problems: None.

Test #7.7.1: Data Digest Error on NOP-Out

Purpose: To see that the DUT properly handles a data digest error on a NOP-Out PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the target, any PDU with a payload digest error is discarded and a Reject PDU is sent. No further action is necessary for targets if the discarded PDU is a non-data PDU. The Initiator may then retry the PDU.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a NOP-Out ping to the DUT. This NOP-Out should have a Data Digest Error.
- The DUT is expected to transmit a Reject PDU.
- The Testing Station should transmit a READ command to the DUT with a CmdSN of one more than the rejected NOP-Out PDU, followed by a NOP-Out PDU with the same CmdSN as the original.

Observable Results:

- Verify that the DUT transmits a Reject PDU to the first NOP-Out PDU. Verify that the DUT responds properly to the READ and NOP-Out PDUs by transmitting Data and Status=GOOD and NOP-In respectively.

Possible Problems: None.

Test #7.7.2: Data Digest Error on Immediate NOP-Out

Purpose: To see that the DUT properly handles a data digest error on an immediate NOP-Out PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the target, any PDU with a payload digest error is discarded and a Reject PDU is sent. No further action is necessary for targets if the discarded PDU is a non-data PDU. The Initiator may then retry the PDU.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit an immediate NOP-Out ping to the DUT. This NOP-Out should have a Data Digest Error.
- The DUT is expected to transmit a Reject PDU.
- The Testing Station should transmit a READ command to the DUT with a CmdSN the same as the rejected NOP-Out PDU, followed by an immediate NOP-Out PDU also with the same CmdSN as the original.

Observable Results:

- Verify that the DUT transmits a Reject PDU to the first immediate NOP-Out PDU. Verify that the DUT responds properly to the READ and immediate NOP-Out PDUs by transmitting Data and Status=GOOD and NOP-In respectively.

Possible Problems: None.

Test #7.8.1: Data Digest Error on Text Request

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a data digest error is detected on a Text Request PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 18, 2007

Discussion: At the target, any PDU with a payload digest error is discarded and a Reject PDU is sent. No further action is necessary for targets if the discarded PDU is a non-data PDU. The Initiator may then retry the PDU.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a Text Request to the DUT. This Text Request should have a Data Digest Error.
- The DUT is expected to transmit a Reject PDU.
- The Testing Station should transmit a READ command to the DUT with a CmdSN of one more than the rejected Text Request PDU, followed by a Text Request PDU with the same CmdSN as the original.

Observable Results:

- Verify that the DUT transmits a Reject PDU to the first Text Request PDU. Verify that the DUT responds properly to the READ and Text Request PDUs by transmitting Data and Status=GOOD and Text Response respectively.

Possible Problems: None.

Test #7.8.2: Data Digest Error on Immediate Text Request

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a data digest error is detected on an immediate Text Request PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 18, 2007

Discussion: At the target, any PDU with a payload digest error is discarded and a Reject PDU is sent. No further action is necessary for targets if the discarded PDU is a non-data PDU. The Initiator may then retry the PDU.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit an immediate Text Request to the DUT. This Text Request should have a Data Digest Error.
- The DUT is expected to transmit a Reject PDU.
- The Testing Station should transmit a READ command to the DUT with a CmdSN the same as the rejected Text Request PDU, followed by another immediate Text Request PDU with the same CmdSN as the original also.

Observable Results:

- Verify that the DUT transmits a Reject PDU to the first immediate Text Request PDU. Verify that the DUT responds properly to the READ and immediate Text Request PDUs by transmitting Data and Status=GOOD and Text Response respectively.

Possible Problems: None.

Test #7.9.1: Data Digest Error on Text Response

Purpose: To see that the DUT properly handles the recovery actions of an initiator detecting a data digest error on a Text Response PDU.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 18, 2007

Discussion: At the Initiator, any PDU with a payload digest error is discarded. If the discarded PDU is a response PDU, the Initiator MUST do one of the following: request retransmission with SNACK, logout the connection for recovery and continue the tasks on a different connection instance as described in Section 6.2 Retry and Reassign in Recovery, or logout to close the connection The target then has the option of retransmitting the PDU or transmitting SNACK Reject.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a Text Request to the DUT, then wait for a Text Response.
- Once the Testing Station receives the Text Response, it should simulate a Data Digest Error on that Text Response. The Testing Station should transmit SNACK for the 'dropped' PDU.

Observable Results:

- Verify that the DUT either retransmits the PDU or transmits SNACK Reject.

Possible Problems: None.

Test #7.9.2: Data Digest Error on Text Response

Purpose: To see that the DUT properly handles the recovery actions of an initiator detecting a data digest error on a Text Response PDU when the Text request was immediate.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.7

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the Initiator, any PDU with a payload digest error is discarded. If the discarded PDU is a response PDU, the Initiator MUST do one of the following: request retransmission with SNACK, logout the connection for recovery and continue the tasks on a different connection instance as described in Section 6.2 Retry and Reassign in Recovery, or logout to close the connection The target then has the option of retransmitting the PDU or transmitting SNACK Reject.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit an immediate Text Request to the DUT, then wait for a Text Response.
- Once the Testing Station receives the Text Response, it should simulate a Data Digest Error on that Text Response. The Testing Station should transmit SNACK for the 'dropped' PDU.

Observable Results:

- Verify that the DUT either retransmits the PDU or transmits SNACK Reject.

Possible Problems: None.

The University of New Hampshire
InterOperability Laboratory

GROUP 8: SEQUENCE ERROR RECOVERY FOR TARGETS

Overview: This group of tests verifies the sequence error recovery of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #8.1: Out of Order DataSN (Not Last in Sequence)

Purpose: To see that the DUT properly identifies and reacts to a PDU with an out of order DataSN.

Reference: iSCSI Standard 6.7, 6.8

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: When a target receives a data PDU with an out of order DataSN, it means that the target must have hit a header or payload digest error on at least one of the earlier data PDUs. The target MUST address these implied digest errors as described in Section 6.7 Digest Errors.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command.
- Once R2T is received from the DUT the Testing Station should start sending Data-Out PDUs to satisfy the R2T. One of the Data-Out PDUs sent should have a DataSN of 2 greater than the last Data-Out, as opposed to 1 greater as would normally be the case. This should not be the final PDU in the sequence (i.e. does not have the F bit set). This will have the effect of 'skipping' one DataSN. Data-PDU's should be transmitted until the R2T is satisfied, continuing the DataSN count from the new DataSN.

Observable Results:

- Verify that the DUT does one of the following: 1) Close the Connection or 2) Transmit Reject PDU. If the DUT chooses 2 it MUST either then request retransmission with recovery R2T or transmit a SCSI Response with status CHECK CONDITION.

Possible Problems: None.

Test #8.2: Out of Order DataSN (Last in Sequence)

Purpose: To see that the DUT properly identifies and reacts to a PDU with an out of order DataSN.

Reference: iSCSI Standard 6.7, 6.8

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: When a target receives a data PDU with an out of order DataSN, it means that the target must have hit a header or payload digest error on at least one of the earlier data PDUs. The target MUST address these implied digest errors as described in Section 6.7 Digest Errors.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes, DefaultTime2Wait=2, DefaultTime2Retain=5.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command.
- Once R2T is received from the DUT the Testing Station should start sending Data-Out PDUs to satisfy the R2T. One of the Data-Out PDUs sent should have a DataSN of 2 greater than the last Data-Out, as opposed to 1 greater as would normally be the case. This should not be the final PDU in the sequence (i.e. does not have the F bit set). Data-PDU's should be transmitted until the R2T is satisfied, continuing the DataSN count from the original DataSN. This will have the effect of 'swapping' two DataSN values.

Observable Results:

- Verify that the DUT does one of the following: 1) Close the Connection or 2) Transmit Reject PDU. If the DUT chooses 2 it MUST either then request retransmission with recovery R2T or transmit a SCSI Response with status CHECK CONDITION.

Possible Problems: None.

Test #8.3: Out of Range DataSN

Purpose: To see that the DUT properly identifies and reacts to a PDU with an out of order DataSN.

Reference: iSCSI Standard 6.7, 6.8

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: When a target receives a data PDU with an out of order DataSN, it means that the target must have hit a header or payload digest error on at least one of the earlier data PDUs. The target MUST address these implied digest errors as described in Section 6.7 Digest Errors.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- Negotiate the following keys: ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes, DefaultTime2Wait=2, DefaultTime2Retain=5.
- The Testing Station should move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command.
- Once R2T is received from the DUT the Testing Station should start sending Data-Out PDUs to satisfy the R2T. One of the Data-Out PDUs sent should have a DataSN greater than the current DataSN by more than the number of Data PDUs in the sequence. This should not be the final PDU in the sequence (i.e. does not have the F bit set). Data PDUs should be transmitted until the R2T is satisfied, continuing the DataSN count from the original DataSN.

Observable Results:

- Verify that the DUT does one of the following: 1) Close the Connection or 2) Transmit Reject PDU. If the DUT chooses 2 it MUST either then request retransmission with recovery R2T or transmit a SCSI Response with status CHECK CONDITION.

Possible Problems: None.

The University of New Hampshire
InterOperability Laboratory

GROUP 9: DROPPED PDU RECOVERY FOR TARGETS

Overview: This group of tests verifies the dropped PDU recovery functionality of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #9.1.1: Drop Immediate Command

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when an immediate command has been dropped.

Reference: iSCSI Standard 6.1.4.2, 6.2

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: A request not acknowledged for a long time is an error, which lends itself to within connection recovery. Requests are acknowledged explicitly through ExpCmdSN or implicitly by receiving data and/or status. An initiator may retry non-acknowledged commands.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ErrorRecoveryLevel>0 and move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should simulate an immediate READ command being dropped in transit to the DUT.
- Transmit a second READ command with the same CmdSN as the dropped command PDU, although this time without the immediate bit set.
- The Testing Station should retry the dropped PDU, transmitting a READ command with the immediate bit set and the same CmdSN as the previous READ command.

Observable Results:

- Verify that the DUT properly responds to both received commands and does not transmit Reject, close the connection, or ignore the duplicate CmdSN.

Possible Problems: None.

Test #9.1.2: Drop Non-Immediate Command

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a command has been dropped.

Reference: iSCSI Standard 6.1.4.2, 6.2

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: A request not acknowledged for a long time is an error, which lends itself to within connection recovery. Requests are acknowledged explicitly through ExpCmdSN or implicitly by receiving data and/or status. An initiator may retry non-acknowledged commands.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ErrorRecoveryLevel>0 and move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should simulate a READ command being dropped in transit to the DUT.
- Transmit a new READ command with the CmdSN one more than the previous dropped command.
- The Testing Station should retry the dropped PDU, transmitting a READ command with the same CmdSN as the original READ command.

Observable Results:

- Verify that the DUT properly responds to both received commands and does not transmit Reject, close the connection, or ignore either command.

Possible Problems: None.

Test #9.2.1: Drop Solicited Data-Out

Purpose: To see that the DUT properly handles the recovery actions when a solicited Data-Out PDU has been dropped.

Reference: iSCSI Standard 6.1.4.1, 6.7, 6.8

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: When a target receives a data PDU with an out of order DataSN, it means that the target must have hit a header or payload digest error on at least one of the earlier data PDUs. The target MUST address these implied digest errors as described in Section 6.7 Digest Errors.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ErrorRecoveryLevel>0, ImmediateData=No, InitialR2T=Yes, MaxOutstandingR2Ts=4, MaxBurstSize=4096, MaxRecvDataSegmentLength=1024, and move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a WRITE command for 4096 bytes to the DUT, then wait for R2Ts from the DUT for all data associated with the command.
- The Testing Station should transmit 4 Data-Out PDUs to the DUT, with the second one being dropped before it reaches the DUT.

Observable Results:

- Verify that the DUT either transmits a Recovery R2T, terminates the task with CHECK CONDITION once the Data-Out with F=1 is received, or closes the connection.

Possible Problems: None.

Test #9.3.1: Drop Data-In

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a Data-In PDU has been dropped.

Reference: iSCSI Standard 6.1.4.1, 6.8

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 30, 2008

Discussion: At the Initiator a lost Data-In PDU error lends itself to within-command recovery. This will be detected usually by a sequence reception timeout. The initiator can handle this error as specified in Section 6.8 Sequence Errors, by using the option of a SNACK.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login, negotiating ErrorRecoveryLevel>0, MaxRecvDataSegmentLength=1024, and move into the Full Feature Phase.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a READ command for 4096 bytes to the DUT, then wait for 4 Data-In PDUs to the DUT. The Testing Station should behave as if the second Data-In PDU was dropped and transmit SNACK to request the second Data-In PDU from the DUT.

Observable Results:

- Verify that the DUT either retransmits the dropped Data-In PDU or transmits SNACK reject. If the DUT transmits SNACK reject and status has not already been sent for the command, the target must terminate the command with status CHECK CONDITION.

Possible Problems: None.

Test #9.4.1: Drop Text Response

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a Text Response PDU has been dropped.

Reference: iSCSI Standard 6.1.4.2, 6.2

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the Initiator, a lost iSCSI numbered response may be detected as a sequence error and lend itself to within-connection recovery. It can be recognized by receiving a Response PDU with a higher StatSN than expected. Retry MUST NOT be used for reasons other than plugging command sequence gaps, and in particular, cannot be used for requesting PDU retransmissions from a target. In this case, sequence error handling is done as specified in Section 6.8 Sequence Errors, using the option of a SNACK.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a Text Request to the DUT to with a vendor specific key=value pair in the extended key format. The DUT is expected to respond with a Text Response, however the Testing Station will simulate this response PDU being dropped.
- After 1 second, the Testing Station should retry the Text Request, sending an identical copy of the original Text Request. The DUT is expected to ignore this retry.
- After 1 more second, the Testing Station should retry the Text Request a second time, sending an identical copy of the original Text Request. The DUT is expected to ignore this retry.
- The Testing Station should transmit a NOP-Out ping. The DUT is expected to respond with a NOP-In response.
- The Testing Station should transmit a SNACK to request retransmission of the dropped Text Response PDU.

Observable Results:

- Verify that the DUT silently ignores any command retries from the Testing Station.
- Verify that the DUT retransmits the PDU when SNACK is received. The Target may also transmit SNACK Reject followed by CHECK CONDITION.
- Verify that the NOP-In transmitted by the DUT carries an appropriate StatSN.

Possible Problems: None.

Test #9.4.2: Drop Text Request

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a Text Request PDU has been dropped.

Reference: iSCSI Standard 6.1.4.2, 6.2

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the Initiator, a request not acknowledged for a long time may lend itself to within-connection recovery. An initiator may retry non-acknowledged commands.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a Text Request to the DUT to with a vendor specifc key=value pair in the extended key format, however this PDU will be dropped before it reaches the DUT. The DUT should send a second Text Request to the DUT with a different vendor specific key=value pair. The DUT is expected to respond with a Text Response
- After 1 second, the Testing Station should retry the Text Request, sending an identical copy of the original Text Request.

Observable Results:

- Verify that the DUT transmits a Text Response to both Text Requests that are received.

Possible Problems: None.

Test #9.5.1: Drop NOP-Out

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a NOP-Out PDU has been dropped.

Reference: iSCSI Standard 6.1.4.2, 6.2

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the Initiator, a request not acknowledged for a long time may lend itself to within connection recovery. An initiator may retry non-acknowledged commands.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a NOP-Out to the DUT, however this PDU will be dropped before it reaches the DUT. The DUT should send a second NOP-Out to the DUT. The DUT is expected to respond with a NOP-In.
- After 1 second, the Testing Station should retry the original NOP-Out, sending an identical copy of the original NOP-Out.

Observable Results:

- Verify that the DUT transmits a NOP-In to each NOP-Out received.

Possible Problems: None.

Test #9.5.2: Drop NOP-In

Purpose: To see that the DUT properly handles the recovery actions of an Initiator when a NOP-In has been dropped.

Reference: iSCSI Standard 6.1.4.2, 6.2, 6.2.1

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: At the Initiator a lost iSCSI numbered response may be detected as a sequence error and lend itself to within-connection recovery. It can be recognized by receiving a Response PDU with a higher StatSN than expected. Retry MUST NOT be used for reasons other than plugging command sequence gaps, and in particular, cannot be used for requesting PDU retransmissions from a target. In this case, sequence error handling is done as specified in Section 6.8 Sequence Errors, using the option of a SNACK.

Test Setup: The DUT and Test Station pair should be able to make a TCP connection.

Procedure:

- Open a normal session to the DUT.
- The Testing Station should perform a Standard Login. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands, waiting for status on each.
- The Testing Station should transmit a NOP-Out to the DUT. The DUT is expected to reply with a NOP-In response, however the Testing Station will simulate this response PDU being dropped.
- After 1 second, the Testing Station should retry the NOP-Out, sending an identical copy of the original Text Request. The DUT is expected to ignore this retry.
- After 1 more second, the Testing Station should retry the NOP-Out a second time, sending an identical copy of the original NOP-Out. The DUT is expected to ignore this retry.
- The Testing Station should transmit a new NOP-Out ping. The DUT is expected to respond with a NOP-In response.
- The Testing Station should transmit a SNACK to request retransmission of the dropped NOP-In PDU.

Observable Results:

- Verify that the DUT silently ignores any retries from the Testing Station.
- Verify that the DUT retransmits the PDU when SNACK is received. The Target may also transmit SNACK Reject followed by CHECK CONDITION.
- Verify that the NOP-In transmitted by the DUT carries an appropriate StatSN.

Possible Problems: None.

The University of New Hampshire
InterOperability Laboratory

GROUP 10: CONNECTION REINSTATEMENT FOR TARGETS

Overview: This group of tests verifies the connection reinstatement functionality of iSCSI targets defined in RFC 3720, as amended by RFC 5048. Comments and questions regarding the implementation of these tests are welcome, and may be forwarded to Peter Scruton, UNH InterOperability Lab (pjs@iol.unh.edu).

Test #10.1: Connection Reinstatement

Purpose: To see that the DUT properly handles an initiator reinstating a connection.

Reference: iSCSI Standard 5.3.4

Resource Requirements: A Test Generator tool capable of producing iSCSI PDUs and transporting them over a TCP connection.

Last Modification: October 31, 2008

Discussion: Connection reinstatement occurs when an initiator logs in with a target using an ISID-TSIH-CID combination that may be currently active from the targets perspective.

Test Setup: The DUT and Test Station pair should be able to make two TCP connections.

Procedure:

- Open a normal session to the DUT.
- On two connections the Testing Station should perform a Standard Login, negotiating ImmediateData=No, InitialR2T=Yes. Negotiate ErrorRecoveryLevel>0.
- The Testing Station should perform INQUIRY, READ_CAPACITY, and TEST_UNIT_READY commands wait for status on each command.
- The Testing Station should drop one connection, then reinstate it using the same ISID, TSIH and CID.

Observable Results:

- Verify that the DUT accepts the reinstated connection and does not close the session.

Possible Problems: None.