OCP C&I Storage

Certification Specification and Test Plan

Version 0.14

Revision History

Date	Name	Description
11/5/2014	Carlos Cardenas	Version 0.14 (1) Add throughput test criteria (RAID 0)
8/8/2014	Carlos Cardenas	Version 0.13 (1) Corrected typos of RAID 0 (should be RAID 1) (2) Grammar corrections (3) Change each HHD tray has 1 connection to 1 RAID 1 or 1 HBA port (6.3.1/7.3.1) (4) Remove non storage hardware specs for testing (CPU, RAM, etc…) (10.2) (5) Remove Network services (10.5)
4/13/2014	Chilung Wang	Version 0.12 (1) According to Bear Sawicki Seagate suggestion on 4/7/2014, modify CS-004-0001 to add an apostrophe after the word components.
2/13/2014	Chilung Wang	Version 0.11 (1) modify SR-004-0003 Requirement Statement based on the suggestion from Per Brashers. (1) modify SR-005-0001 Requirement Statement by changing RAID 0 to RAID 1 based on the suggestion from Per Brashers. (3) modify SR-005-0002 to precisely define the action.
2/11/2014	Chilung Wang	Version 0.10 (1) add the comment from Per Brashers on SR-002-0004 (2) modify SR-003-0003 Requirement Statement based on the suggestion from Per Brashers.
1/26/2014	Chilung Wang	Version 0.09 (1) revise the Requirement Source from "Open Vault Storage Hardware V0.7" to "Open Vault Storage

		Hardware V0.8" (2) change title from "OCP C&I Storage Certified Specification and Test Plan" to "OCP C&I Storage Certification Specification and Test Plan"
1/6/2014	Chilung Wang	Version 0.07 & 0.08 (1) General clean up
1/5/2014	Chilung Wang	Version 0.06 (1) insert 24 hours idle test as SR-004-0002 (2) change SR-004-0002 as SR-004-0003 change SR-004-0003 as SR-004-0004 change SR-004-0004 as SR-004-0005 change SR-004-0005 as SR-004-0006 change CS-004-0002 as CS-004-0003 change CS-004-0003 as CS-004-0004 change CS-004-0004 as CS-004-0005 change CS-004-0005 as CS-004-0006. (3) add SR-004-0007, CS-004-0007 (4) add SR-005-0001, CS-005-0001 (5) add SR-005-0002, CS-005-0002 (6) create the template for TC-001-0001-001 ~ TC-005-0002-001 according to their corresponding CS items
1/4/2014	Chilung Wang	Version 0.05 (1) add 3.1 reference (2) add SR-002-0001, CS-002-0001 (3) add SR-002-0002, CS-002-0002
1/2/2014	Chilung Wang	Version 0.04 (1) add SR-003-0001, CS-003-0001
1/2/2014	Chilung Wang	Version 0.03 (1) add SR-001-0001, CS-001-0001 (2) add SR-001-0002, CS-001-0002 (3) add SR-002-0003, CS-002-0003 (4) add SR-002-0004, CS-002-0004 (5) add SR-003-0002, CS-003-0002

		(6) add SR-003-0003, CS-003-0003 (7) add SR-004-0001, CS-004-0001 (8) add SR-004-0002, CS-004-0002 (9) add SR-004-0003, CS-004-0003 (10) add SR-004-0004, CS-004-0004 (11) add SR-004-0005, CS-004-0005
1/1/2014	Chilung Wang	Version 0.02 (1) add task template for Specification Requirement (1) add task template for Certification Specification
1/1/2014	Chilung Wang	Version 0.01 for document template.

1.   Summary

When data center design and hardware design build data center infrastructure, they can improve efficiency and reduce power consumption. To this end, the Open Compute Project is a set of technologies that reduces energy consumption and cost, increases reliability and choice in the market place, and simplifies operations and maintenance. One key objective is openness—the project is starting with the opening of the specifications and mechanical designs for the major components of a data center, and the efficiency results achieved at facilities using Open Compute technologies.

The aim of this document is to provide all the information needed to perform OCP Certified testing on a proposed Open Compute compliant platform. It will provide information on getting and installing the testing tools as well as outline several test cases and provide additional information.

2.   License

As of September 12, 2013, the following persons or entities (according to alphabet sequence) have made this Specification available under the Open Web Foundation Final Specification Agreement (OWFa 1.0), which is available at

http://www.openwebfoundation.org/legal/the-owf-1-0-agreements/owf-contributor-license-agreement-1-0---copyright-and-patent.

Industrial Technology Research Institute
Canonical Ltd.
Facebook, Inc.

3.   Reference & Glossary

3.1.   Reference

- Open Vault Storage Hardware V0.8
- SCSI Enclosure Services standards (most recent is SES-2 ANSI INCITS 448-2008) and the latest draft (ses3r03.pdf at www.t10.org)
- Serial Attached SCSI - 2 (SAS-2) 10.4.3 for SMP functions
- Ubuntu SCSI Enclosure Service (SES) user page:
  http://manpages.ubuntu.com/manpages/precise/en/man8/sg_ses.8.html
  The example of sg3_utils package
  http://sg.danny.cz/sg/sg3_utils.html
- Ubuntu Serial Management Protocol (SMP) user page:
  http://manpages.ubuntu.com/manpages/precise/en/man8/smp_utils.8.html
  The example of smp_utils package:
  http://sg.danny.cz/sg/smp_utils.html
  http://sg.danny.cz/sg/smp_utils095.html

3.2. Glossary

The following definitions shall apply to terms used in this definition.

1GbE: 1 Gigabit - Network speed for Gigabit Ethernet (1,000Mbps)

10GbE: 10 Gigabit - Network speed for 10 Gigabit Ethernet (10,000Mbps)

BMC: Baseboard Management Controller - A device in many server models that allows remote in and out of band management of hardware

checkbox: Checkbox - an extensible test harness used for running tests against an SUT or running external test suites and collating results into an output file.
               DCMI: Data Center Manageability Interface

DHCP: Dynamic Host Control Protocol - method for providing IP addresses to the SUT and Targets

dOS: Disposable OS - the OS to be run on the SUT (May or may not be physically installed)

HBA: Host Bus Adapter

IPMI: Intelligent Platform Management Interface - A technology for remotely connecting to a system to perform management functions

LAN: Local Area Network - the network your SUT and targets are connected to. This does not need to be internet accessible (though that is preferable if possible)

ME: Management Engine - see BMC above

NIC: Network Interface Card - the network device(s)

PSU: Power Supply Unit - device in the SUT that provides power to the system

PXE: Pre-boot Execution Environment - A technology that allows you to boot a system using remote images for easy deployment or network based installation

RAID: Redundant Array of Independent Disks - multiple disk storage providing redundancy, parity checking and data integrity

RAM: Random Access Memory - System Memory

SAN: Storage Area Network - Usually Fibre Channel

SAS: Serial Attached SCSI

SATA: Serial Advanced Technology Attachment

SES: SCSI Enclosure Service

SMP: Serial Management Protocol

SUT: System Under Test - The machine you are testing for certification.

UUT: Unit Under Test – same as SUT

4. Notation Rules

CP-*mmm*

CP: Certification Principle

mmm: 3 digits serial number for Certification Principle; start from 001

SR-*mmm-nnnn*

SR: Specification Requirement

mmm: 3 digits serial number for Specification Requirement module; start from 001

nnnn: 4 digits serial number for Specification Requirement statement in a certain module; start from 001

CS-*mmm-nnnn*

CS: Certification Specification

mmm: 3 digits serial number for Certification Specification module; start from 001

nnnn: 4 digits serial number for Certification Specification statement in a certain module; start from 001

TC-*mmm-nnnn-ooo*

TC: Test Case

mmm: 3 digits serial number for Test Case module; start from 001

nnnn: 4 digits serial number for Test Case statement in a certain module; start from 001

ooo: 3 digits serial number for Test Case item in a certain statement; start from 001

5. Certification Principles

Certification Principle No.	Description	Specification Requirement No.
CP-001	Implements a specification submitted to OCP	SR-001, SR-002, SR-003, SR-004
CP-002	Interoperable with OCP racks and systems	SR-001, SR-005
CP-003	Efficiency and serviceability measured and verified	SR-003, SR-004
CP-004	Hardware verified, boots to an OS, base application compatibility testing	SR-001, SR-004

6. Specification Requirement

6.1. SR-001 External management interfaces

Specification Requirement No.	Title
SR-001-0001	SES commands
SR-001-0002	Diagnostics CLI

6.1.1. SR-001-0001 SES commands

Specification Requirement No.	SR-001-0001
Title	SES commands
Requirement Statement	The SUT can respond SCSI Enclosure Service (SES) pages which are pages that are accessed via the SCSI commands SEND DIAGNOSTICS (control pages) and RECEIVE DIAGNOSTIC RESULTS (status pages).
Requirement Source	"Open Vault Storage Hardware V0.8", 10.2
Certification Principle No.	CP-001, CP-002, CP-004
Certification Specification No.	CS-001-0001

6.1.2. SR-001-0002 Diagnostics CLI

Specification Requirement No.	SR-001-0002
Title	Diagnostics CLI
Requirement Statement	The ODM is responsible for creating and supporting the

	firmware to execute all enclosure management features. The ODM is also responsible for creating a set of diagnostic commands that are capable of providing status summary and device information details to a user terminal.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.2
Certification Principle No.	CP-001, CP-002, CP-004
Certification Specification No.	CS-001-0002

6.2.   SR-002 I/O connectivity and PHY control/monitoring

Specification Requirement No.	Title
SR-002-0001	SMP functions
SR-002-0002	PHY error counters
SR-002-0003	Topology discovery and routing table management
SR-002-0004	Staggered disk drive spin-up

6.2.1.   SR-002-0001 SMP functions

Specification Requirement No.	SR-002-0001
Title	SMP functions
Requirement Statement	The SUT can respond Serial Management Protocol (SMP) commands.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.1
Certification Principle No.	CP-001
Certification Specification No.	CS-002-0001

6.2.2. SR-002-0002 PHY error counters

Specification Requirement No.	SR-002-0002
Title	PHY error counters
Requirement Statement	The SUT should report SMP PHY error logs.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.1
Certification Principle No.	CP-001
Certification Specification No.	CS-002-0002

6.2.3. SR-002-0003 Topology discovery and routing table management

Specification Requirement No.	SR-002-0003
Title	Topology discovery and routing table management
Requirement Statement	(1) The SUT can report the HDD topology and routing information. (2) A specific HDD in the SUT can be easily located.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.7, 10.8
Certification Principle No.	CP-001
Certification Specification No.	CS-002-0003

6.2.4. SR-002-0004 Staggered disk drive spin-up

Specification Requirement No.	SR-002-0004
Title	Staggered disk drive spin-up

Requirement Statement	When an HDD spins up after power on, it draws excessive current on both 12V and 5V. Especially for the 12V rail, the peak current may reach 1.5A ~ 2A range, which is 2 ~ 3 times the maximum current during normal operation. To minimize the impact on the system power budget, the hardware design supports a staggered power-on feature, and the enclosure management firmware implements a grouped spin-up control mechanism.
	● The group definition of hard disk drives follows the SAS expander chip vendor's strategy.
	● The ODM defines the quantity of hard disk drives in each group.
	● The ODM defines the delay interval between each group.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.5
Certification Principle No.	CP-001
Certification Specification No.	CS-002-0004

6.3.   SR-003 General enclosure management features

Specification Requirement No.	Title
SR-003-0001	Redundant enclosure service processes
SR-003-0002	Power monitoring and control
SR-003-0003	Intelligent cooling fan control scheme

6.3.1.   SR-003-0001 Enclosure service processes

Specification Requirement No.	SR-003-0001
Title	Enclosure service processes

Requirement Statement	The SUT should have two connections to the host: 1 per HDD tray.
Requirement Source	"Open Vault Storage Hardware V0.8", 4.4, 10.1
Certification Principle No.	CP-001, CP-003
Certification Specification No.	CS-003-0001

6.3.2.   SR-003-0002 Power monitoring and control

Specification Requirement No.	SR-003-0002
Title	Power monitoring and control
Requirement Statement	To be aligned with a power saving strategy in the future of data center operations, the SUT supports a HDD spin-down control and status monitoring.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.6
Certification Principle No.	CP-001, CP-003
Certification Specification No.	CS-003-0002

6.3.3.   SR-003-0003 Intelligent cooling fan control scheme

Specification Requirement No.	SR-003-0003
Title	Intelligent cooling fan control scheme
Requirement Statement	The SUT thermal management system supports two schemes: ● One scheme is to control fan power management by each SAS expander chip itself with thermal sensors; a PWM comparator on the FCB selects the maximum PWM value from the four SAS

	expanders and drives the fans. ● The other scheme is each expander chip only reports all temperature values to the host server; the host server calculates suitable PWM numbers and controls fan speed via SES commands sent to the SAS expander(s). The need for this two tier system is to A) have the host set suitable PWM based on application knowledge, and B) have KNOX set it based on the host being unavailable, call it a fail-safe, both are required.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.3
Certification Principle No.	CP-001, CP-003
Certification Specification No.	CS-003-0003

6.4.　SR-004 Reliability, availability and serviceability

Specification Requirement No.	Title
SR-004-0001	Power on self-test
SR-004-0002	24 hours idle test
SR-004-0003	Enclosure event log
SR-004-0004	EEPROM contents update for each field replaceable unit
SR-004-0005	Firmware in-system upgrade for each SAS expander
SR-004-0006	One command/script to upgrade firmware for all HDDs
SR-004-0007	HDD healthiness checking

6.4.1. SR-004-0001 Power on self-test

Specification Requirement No.	SR-004-0001
Title	Power on self-test
Requirement Statement	The SUT should be ready to report the healthiness of all its components after power on.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.1
Certification Principle No.	CP-001, CP-003, CP-004
Certification Specification No.	CS-004-0001

6.4.2. SR-004-0002 24 hours idle test

Specification Requirement No.	SR-004-0002
Title	24 hours idle test
Requirement Statement	The SUT should remain healthy on all its components after 24 hours idle time.
Requirement Source	N/A
Certification Principle No.	CP-001, CP-003, CP-004
Certification Specification No.	CS-004-0002

6.4.3. SR-004-0003 Enclosure event log

Specification Requirement No.	SR-004-0003
Title	Enclosure event log
Requirement Statement	(1) There are different levels of consideration of system / hardware thermal protection for the SUT. They include: ● Setting a Warning level for each monitored

	parameter (including all temperatures, voltages and input power). When any one of the parameters reaches its warning value, the firmware should report an ALARM status to the host server. The host server can predictively perform some actions to avoid actual (both hardware and software) protection in advance. ● Setting a Software Protection level for each monitored parameter. When one parameter reaches this level, the related fault LED will light, an error code will be generated, and the firmware should report a CRITICAL status to the host server. The host server takes suitable actions to protect the system, such as setting maximum speed to the fan or power off the related HDDs. ● Setting a Hardware Protection level. When some parameters reach this level or meet a set of predefined conditions, hardware protection actions will be taken to prevent system damage or reduce the cost of more power and more airflow. The default behavior is to issues Emergency Power Off on both the KNOX and the server. (2) The SUT should sustain with 24 hours idle test and there is no event Log.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.4
Certification Principle No.	CP-001, CP-003, CP-004
Certification Specification No.	CS-004-0003

6.4.4.　SR-004-0004 EEPROM contents update for each field replaceable unit

Specification Requirement No.	SR-004-0004
Title	EEPROM contents update for each field replaceable unit

Requirement Statement	The firmware of each field replaceable unit can be upgraded.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.1
Certification Principle No.	CP-001, CP-003, CP-004
Certification Specification No.	CS-004-0004

6.4.5. SR-004-0005 Firmware in-system upgrade for each SAS expander

Specification Requirement No.	SR-004-0005
Title	Firmware in-system upgrade for each SAS expander
Requirement Statement	The firmware of each SAS expander can be upgraded.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.1
Certification Principle No.	CP-001, CP-003, CP-004
Certification Specification No.	CS-004-0005

6.4.6. SR-004-0006 One command/script to upgrade firmware for all HDDs

Specification Requirement No.	SR-004-0006
Title	One command/script to upgrade firmware for all HDDs
Requirement Statement	The firmware for all HDDs can be upgraded in a single command.
Requirement Source	"Open Vault Storage Hardware V0.8", 10.1
Certification Principle No.	CP-001, CP-003, CP-004

Certification Specification No.	CS-004-0006

6.4.7. SR-004-0007 HDD healthiness checking

Specification Requirement No.	SR-004-0007
Title	HDD healthiness checking
Requirement Statement	All HDDs should report they are in good condition.
Requirement Source	NA
Certification Principle No.	CP-001, CP-003, CP-004
Certification Specification No.	CS-004-0007

6.5. SR-005 Interoperability with application client

Specification Requirement No.	Title
SR-005-0001	RAID 0 test
SR-005-0002	RAID 1 test
SR-005-0003	RAID 6 test

6.5.1. SR-005-0001 RAID 0 test

Specification Requirement No.	SR-005-0001
Title	RAID 0 test
Requirement Statement	Establish the SUT with its application client (a RAID card in a host server), perform RAID 0 functional test: build RAID 1, erase the data, basic read / write.

Requirement Source	NA
Certification Principle No.	CP-002
Certification Specification No.	CS-005-0001

6.5.2.   SR-005-0001 RAID 1 test

Specification Requirement No.	SR-005-0002
Title	RAID 1 test
Requirement Statement	Establish the SUT with its application client (a RAID card in a host server), perform RAID 1 functional test: build RAID 1, erase the data, basic read / write.
Requirement Source	NA
Certification Principle No.	CP-002
Certification Specification No.	CS-005-0002

6.5.3.   SR-005-0003 RAID 6 test

Specification Requirement No.	SR-005-0003
Title	RAID 6 test
Requirement Statement	Establish the SUT with its application client (a RAID card in a host server), perform RAID 6 functional test: build RAID 6, erase the data, basic read / write.
Requirement Source	NA
Certification Principle No.	CP-002
Certification Specification No.	CS-005-0003

7. Certification Specification

7.1. CS-001 External management interfaces

7.1.1. CS-001-0001 SES commands

Certification Specification No.	CS-001-0001
Title	SES commands
Specification Statement	The SUT should respond the SES supported diagnostic pages with: • Supported Diagnostic Pages (00h) • Configuration (01h) • Enclosure Control, Enclosure Status (02h) • String Out, String In (04h) • Threshold Out, Threshold In (05h) • Element Descriptor (07h) • Additional Element Status (0Ah) • Download Microcode Control, Download Microcode Status (0Eh)
Specification Requirement No.	SR-001-0001
Test Case No.	

7.1.2. CS-001-0002 Diagnostics CLI

Certification Specification No.	CS-001-0002
Title	Diagnostics CLI
Specification Statement	The SUT should respond the SES command with page name (page code): • Supported Diagnostic Pages (00h) • Configuration (01h)

	• Enclosure Control, Enclosure Status (02h) • String Out, String In (04h) • Threshold Out, Threshold In (05h) • Element Descriptor (07h) • Additional Element Status (0Ah) • Download Microcode Control, Download Microcode Status (0Eh)
Specification Requirement No.	SR-001-0002
Test Case No.	

7.2. CS-002 I/O connectivity and PHY control/monitoring

7.2.1. CS-002-0001 SMP functions

Certification Specification No.	CS-002-0001
Title	SMP functions
Specification Statement	The SUT should respond the SMP function: • Report general (00h) • Report manufacturing information (01h) • Discover (10h) • Report PHY error log (11h) • Report PHY SATA (12h) • PHY control (91h)
Specification Requirement No.	SR-002-0001
Test Case No.	

7.2.2. CS-002-0002 PHY error counters

Certification Specification No.	CS-002-0002

Title	PHY error counters
Specification Statement	The SUT should respond the SMP Report PHY error log function.
Specification Requirement No.	SR-002-0002
Test Case No.	

7.2.3. CS-002-0003 Topology discovery and routing table management

Certification Specification No.	CS-002-0003
Title	Topology discovery and routing table management
Specification Statement	(1) The SUT should respond SMP discover function and reflect the presence of attached HDDs. (2) The SUT should respond to the SMP routing table command. (3) The HDD in SUT should be easily located by lighting the corresponding LED.
Specification Requirement No.	SR-002-0003
Test Case No.	

7.2.4. CS-002-0004 Staggered disk drive spin-up

Certification Specification No.	CS-002-0004
Title	Staggered disk drive spin-up
Specification Statement	By monitoring the status of disk drives in SUT power on stage, the disk drives behave as one group of disk drives spin-up while the other group of disk drives delays spin-up.

Specification Requirement No.	SR-002-0004
Test Case No.	

7.3. CS-003 General enclosure management features

7.3.1. CS-003-0001 Enclosure service processes

Certification Specification No.	CS-003-0001
Title	Enclosure service processes
Specification Statement	Each HDD tray has 1 connection to 1 RAID or 1 HBA port
Specification Requirement No.	SR-003-0001
Test Case No.	

7.3.2. CS-003-0002 Power monitoring and control

Certification Specification No.	CS-003-0002
Title	Power monitoring and control
Specification Statement	SUT should control and monitor the HDD spin up or down.
Specification Requirement No.	SR-003-0002
Test Case No.	

7.3.3. CS-003-0003 Intelligent cooling fan control scheme

Certification Specification No.	CS-003-0003
Title	Intelligent cooling fan control scheme

Specification Statement	The SUT should respond all temperatures' readings.
	The SUT should respond all fans' speed readings.
	The SUT should respond the setting of fans' speed.
Specification Requirement No.	SR-003-0003
Test Case No.	

7.4. CS-004 Reliability, availability and serviceability

7.4.1. CS-004-0001 Power on self-test

Certification Specification No.	CS-004-0001
Title	Power on self-test
Specification Statement	The SUT should report all its components' status.
Specification Requirement No.	SR-004-0001
Test Case No.	

7.4.2. CS-004-0002 24 hours idle test

Certification Specification No.	CS-004-0002
Title	24 hours idle test
Specification Statement	The SUT should function correctly on all its components after 24 hours idle time.
Specification Requirement No.	SR-004-0002
Test Case No.	

7.4.3. CS-004-0003 Enclosure event log

Certification Specification No.	CS-004-0003
Title	Enclosure event log
Specification Statement	- The SUT should set temperature sensor HIGH CRITICAL THRESHOLD, HIGH WARNING THRESHOLD, LOW WARNING THRESHOLD, and LOW CRITICAL THRESHOLD. - When the temperature sensor reading goes higher than HIGH CRITICAL THRESHOLD or lower than LOW CRITICAL THRESHOLD, the SUT should report an over temperature failure or under temperature failure. - When the temperature sensor reading goes higher than HIGH WARNING THRESHOLD or lower than LOW WARNING THRESHOLD, the SUT should report an over temperature warning or under temperature warning. - The SUT should set voltage sensor HIGH CRITICAL THRESHOLD, HIGH WARNING THRESHOLD, LOW WARNING THRESHOLD, and LOW CRITICAL THRESHOLD. - When the voltage sensor reading goes higher than HIGH CRITICAL THRESHOLD or lower than LOW CRITICAL THRESHOLD, the SUT should report an over voltage failure or under voltage failure. - When the voltage sensor reading goes higher than HIGH WARNING THRESHOLD or lower than LOW WARNING THRESHOLD, the SUT should report an over voltage warning or under voltage warning. - The SUT should set current sensor HIGH CRITICAL THRESHOLD, HIGH WARNING THRESHOLD, LOW WARNING THRESHOLD, and LOW CRITICAL THRESHOLD. - When the current sensor reading goes higher than HIGH CRITICAL THRESHOLD or lower than LOW

	CRITICAL THRESHOLD, the SUT should report an over current failure or under current failure. ● When the current sensor reading goes higher than HIGH WARNING THRESHOLD or lower than LOW WARNING THRESHOLD, the SUT should report an over current warning or under current warning.
Specification Requirement No.	SR-004-0003
Test Case No.	

7.4.4. CS-004-0004 EEPROM contents update for each field replaceable unit

Certification Specification No.	CS-004-0004
Title	EEPROM contents update for each field replaceable unit
Specification Statement	The vendor-specific microcode of each field replaceable unit can be upgraded.
Specification Requirement No.	SR-004-0004
Test Case No.	

7.4.5. CS-004-0005 Firmware in-system upgrade for each SAS expander

Certification Specification No.	CS-004-0005
Title	Firmware in-system upgrade for each SAS expander
Specification Statement	The vendor-specific microcode of each SAS expander can be upgraded.
Specification Requirement No.	SR-004-0005

Test Case No.	

7.4.6. CS-004-0006 One command/script to upgrade firmware for all HDDs

Certification Specification No.	CS-004-0006
Title	One command/script to upgrade firmware for all HDDs
Specification Statement	The vendor-specific microcode for all HDDs can be upgraded within a single command.
Specification Requirement No.	SR-004-0006
Test Case No.	

7.4.7. CS-004-0007 HDD healthiness checking

Certification Specification No.	CS-004-0007
Title	HDD healthiness checking
Specification Statement	All HDDs should report they are in good condition under the full bad block scan with four patterns.
Specification Requirement No.	SR-004-0007
Test Case No.	

7.5. CS-005 Interoperability with application client

7.5.1. CS-005-0001 RAID 0 test

Certification Specification No.	CS-005-0001

Title	RAID 0 test
Specification Statement	Establish the SUT with its application client (a RAID card in a host server), from the RAID card, the SUT should be able to be created RAID 0, performed read / write files.
Specification Requirement No.	SR-005-0001
Test Case No.	TC-005-0001

7.5.2. CS-005-0002 RAID 1 test

Certification Specification No.	CS-005-0002
Title	RAID 1 test
Specification Statement	Establish the SUT with its application client (a RAID card in a host server), from the RAID card, the SUT should be able to be created RAID 1, performed read / write files.
Specification Requirement No.	SR-005-0002
Test Case No.	TC-005-0002

7.5.3. CS-005-0003 RAID 6 test

Certification Specification No.	CS-005-0003
Title	RAID 6 test
Specification Statement	Establish the SUT with its application client (a RAID card in a host server), from the RAID card, the SUT should be able to be created RAID 6, performed read / write files, rebuild RAID 6.
Specification Requirement No.	SR-005-0003
Test Case No.	TC-005-0003

8. Test Case

8.1. TC-001 External management interfaces

8.1.1. TC-001-0001 SES commands

8.1.1.1. TC-001-0001-001 SES commands

Test Case No.	TC-001-0001-001
Title	SES commands
Test Case Description	
Certification Specification No.	CS-001-0001

8.1.2. TC-001-0002 Diagnostics CLI

8.1.2.1. TC-001-0002-001 Diagnostics CLI

Test Case No.	TC-001-0002-001
Title	Diagnostics CLI
Test Case Description	
Certification Specification No.	CS-001-0002

8.2. TC-002 I/O connectivity and PHY control/monitoring

8.2.1. TC-002-0001 SMP functions

8.2.1.1. TC-002-0001-001 SMP functions

Test Case No.	TC-002-0001-001

Title	SMP functions
Test Case Description	
Certification Specification No.	CS-002-0001

8.2.2. TC-002-0002 PHY error counters

8.2.2.1. TC-002-0002-001 PHY error counters

Test Case No.	TC-002-0002-001
Title	PHY error counters
Test Case Description	
Certification Specification No.	CS-002-0002

8.2.3. TC-002-0003 Topology discovery and routing table management

8.2.3.1. TC-002-0003-001 Topology discovery and routing table management

Test Case No.	TC-002-0003-001
Title	Topology discovery and routing table management
Test Case Description	
Certification Specification No.	CS-002-0003

8.2.4. TC-002-0004 Staggered disk drive spin-up

8.2.4.1. TC-002-0004-001 Staggered disk drive spin-up

Test Case No.	TC-002-0004-001

Title	Staggered disk drive spin-up
Test Case Description	
Certification Specification No.	CS-002-0004

8.3. TC-003 General enclosure management features

8.3.1. TC-003-0001 Enclosure service processes

8.3.1.1. TC-003-0001-001 Enclosure service processes

Test Case No.	TC-003-0001-001
Title	Enclosure service processes
Test Case Description	
Certification Specification No.	CS-003-0001

8.3.2. TC-003-0002 Power monitoring and control

8.3.2.1. TC-003-0002-001 Power monitoring and control

Test Case No.	TC-003-0002-001
Title	Power monitoring and control
Test Case Description	
Certification Specification No.	CS-003-0002

8.3.3. TC-003-0003 Intelligent cooling fan control scheme

8.3.3.1. TC-003-0003-001 Intelligent cooling fan control scheme

Test Case No.	TC-003-0003-001

Title	Intelligent cooling fan control scheme
Test Case Description	
Certification Specification No.	CS-003-0003

8.4. TC-004 Reliability, availability and serviceability

8.4.1. TC-004-0001 Power on self-test

8.4.1.1. TC-004-0001-001 Power on self-test

Test Case No.	TC-004-0001-001
Title	Power on self-test
Test Case Description	
Certification Specification No.	CS-004-0001

8.4.2. TC-004-0002 24 hours idle test

8.4.2.1. TC-004-0002-001 24 hours idle test

Test Case No.	TC-004-0002-001
Title	24 hours idle test
Test Case Description	
Certification Specification No.	CS-004-0002

8.4.3. TC-004-0003 Enclosure event log

8.4.3.1. TC-004-0003-001 Enclosure event log

Test Case No.	TC-004-0003-001
Title	Enclosure event log
Test Case Description	
Certification Specification No.	CS-004-0003

8.4.4. TC-004-0004 EEPROM contents update for each field replaceable unit

8.4.4.1. TC-004-0004-001 EEPROM contents update for each field replaceable unit

Test Case No.	TC-004-0004-001
Title	EEPROM contents update for each field replaceable unit
Test Case Description	
Certification Specification No.	CS-004-0004

8.4.5. TC-004-0005 Firmware in-system upgrade for each SAS expander

8.4.5.1. TC-004-0005-001 Firmware in-system upgrade for each SAS expander

Test Case No.	TC-004-0005-001
Title	Firmware in-system upgrade for each SAS expander
Test Case Description	
Certification Specification No.	CS-004-0005

8.4.6. TC-004-0006 One command/script to upgrade firmware for all HDDs

8.4.6.1. TC-004-0006-001 One command/script to upgrade firmware for all HDDs

Test Case No.	TC-004-0006-001
Title	One command/script to upgrade firmware for all HDDs
Test Case Description	
Certification Specification No.	CS-004-0006

8.4.7. TC-004-0007 HDD healthiness checking

8.4.7.1. TC-004-0007-001 HDD healthiness checking

Test Case No.	TC-004-0007-001
Title	HDD healthiness checking
Test Case Description	
Certification Specification No.	CS-004-0007

8.5. TC-005 Interoperability with application client

8.5.1. TC-005-0001 RAID 0 test

8.5.1.1. TC-005-0001-001 RAID 0 test

Test Case No.	TC-005-0001-001

Title	RAID 0 test
Test Case Description	
Certification Specification No.	CS-005-0001

8.5.2. TC-005-0002 RAID 1 test

8.5.2.1. TC-005-0002-001 RAID 1 test

Test Case No.	TC-005-0002-001
Title	RAID 1 test
Test Case Description	
Certification Specification No.	CS-005-0002

8.5.3. TC-005-0002 RAID 6 test

8.5.3.1. TC-005-0003-001 RAID 6 test

Test Case No.	TC-005-0003-001
Title	RAID 6 test
Test Case Description	
Certification Specification No.	CS-005-0003

9. Test Cases Execution Sequence

The execution sequence is only used to illustrate the possible procedure. There is no intention to indicate any fix steps. The OCP C&I Test Lab can change the sequence without any notice.

10.   Equipment Requirements

To be able to consider the system as Open Compute Certified, the following requirements have to be met:

10.1.   OCP C&I Certified Pre-requisite

Both existing hardware in mass production and new hardware under engineering qualification are required to go through a standard manufacturing build process. The manufacturing process is required to be reviewed by OCP's C&I Physical Project team. This includes product spec, manufacturing processes, manufacturing software, and product quality management before formal certification testing will be accepted.

10.2.   Hardware Requirements

- Test Sample Size for OCP Certified test is 3 systems. Thus you must have 3 OCP compliant systems with at least 1 hard disk (2 or more if RAID is used)
- BIOS/UEFI should be shipping (production) level firmware

10.3.   Test Equipment

- Writable USB stick (at least 512MB) inserted prior to running checkbox. It must contain a writable file system and a single partition on it.
  - You will need **one USB stick per system**, as the test that uses it is automated and will run without prompting so the media must stay inserted through the whole test run.
  - Do not use an USB stick with a bootable file system and multiple partitions as this can sometimes cause confusing errors during testing.
- Data CDs with some files written to it and inserted prior to running Checkbox. This is required to test the systems optical drive read capabilities.
  - Note that a movie DVD or an audio CD won't be useful in this case, as they are not in the right format for the test.
  - The best option is a CD or DVD that contains a few MB of text and binary data (text files and executables). The more data on the disk, the longer the test will take to execute.
  - If you need to test more than one system then **bring one media per system**, as the test that uses the CD is automated and will run without prompting so the CD must stay inserted through the whole test run.

○ This obviously only applies to SUTs that have an optical drive.

10.4. Software Needed

- Checkbox (for obtaining and installing, see sections below)
- Disposable OS (dOS) for Open Compute Project
  ([http://files.opencompute.org/oc/public.php?service=files&t=31ed9c3012c5de6124a9a7f0 1fc2e619&path=//Images](http://files.opencompute.org/oc/public.php?service=files&t=31ed9c3012c5de6124a9a7f01fc2e619&path=//Images))
- Hardware Management test-suite
- sg_ses utility
  The sg_ses utility enables a user "to manage and sense the state of the power supplies, cooling devices, displays, indicators, individual drives, and other non-SCSI elements installed in an enclosure". The SCSI Enclosure Services standards (most recent is SES-2 ANSI INCITS 448-2008) and the latest draft (ses3r03.pdf at www.t10.org) describe the format that the sg_ses utility expects to find in a SES device ("logical unit" or "process"). The sg_ses utility is found in the sg3_utils (http://sg.danny.cz/sg/sg3_utils.html) package. (http://manpages.ubuntu.com/manpages/precise/en/man8/sg_ses.8.html or http://sg.danny.cz/sg/sg_ses.html)

10.5. Lab Equipment

The lab setup should be sufficient to utilize the hardware in the SUT.
- The Lab should have adequate power of the correct specifications for the SUT. Thus, if the SUT has 220V PSUs, there should be adequate 220V connections.
- The Lab should have L10 server and storage server, rack for integration L11 (chassis and rack).
- The Lab should have an Open Rack version 1.
- The Lab should be a 3rd Party test lab.
  ○ The customer will create details of test plan of the product and sign off approval before Certified test is started
  ○ The test plan will be reviewed by OCP Physical C&I team
  ○ Director, OCP Physical C&I will be oversee all test executions, performing by OCP test labs

11.   Appendix A - Test Report Examples

11.1.   Full Test Report Example

Will add a sample of test report Certified for submission

11.2.   Per-System Test Report Example

Will add a sample of test report after test

11.3.   Software Test Report

A partial sample of test report

Tests Performed

Tests

Name	Result	Comment
TC-001-0008-001-Out_of_band_Power_and_Thermal_Monitoring	PASSED	Outlet Temp: 24 degrees C Inlet Temp: 19 degrees C PCH Temp: 46 degrees C P0 DIMM Temp: 26 degrees C P1 DIMM Temp: 26 degrees C CPU0 Temp: 24 degrees C CPU1 Temp: 23 degrees C
TC-002-0003-001-ME_User_Account	PASSED	Initial authentication of sample servers are fine.
TC-002-0010-002-FRU	PASSED	Product Manufacturer: Wiwynn Product Part Number: 655N2Z1019 Product Serial: 1490001AJ0SA Board Serial: 1490004FJ0SA
TC-002-0011-001-System_Log_Entries	PASSED	Entries Number of each server is more than 256.
TC-002-0008-001-Temp_Sampling_Increment	PASSED	Pass: 1000 Fail: 0