

SSD Testing Discussion Panel

Tim Sharp, Microsoft

Rick Walsh, SANBlaze

Nick Kriczky, Teledyne LeCroy

Vineet Parekh, Meta

Chris Sabol, Google

Yaojie Li, ScaleFlux

Moderator: Ross Stenfort, Meta



OCP
GLOBAL
SUMMIT

OCT 15-17, 2024
SAN JOSE, CA



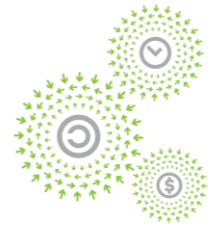
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Comprehensive OCP Testing For SSDs

Timothy Sharp, Microsoft Corp.



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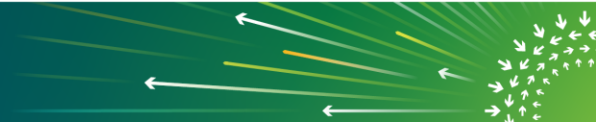
2024

FROM IDEAS TO IMPACT



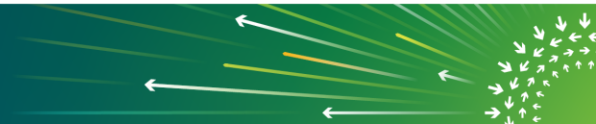
Agenda

- Intro and Background
- Overview of the OCP Test Plan Creation Process
- Breakdown of an OCP Test Procedure
- Benefits of Adopting OCP SSD Req and OCP Testing
- Next Steps



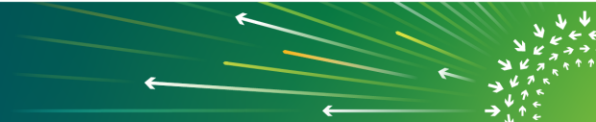
Intro and Background

- Microsoft began work in 2020 to develop tests to verify that our SSD suppliers were complying with the requirements defined in the NVMe Cloud Specification v1.0.
- The initial goal was to define and implement these tests as part of the process of developing a Microsoft specific SSD validation tool to validate our SSD suppliers' products.
- The plan for an internal tool was dropped in favor of supporting commercial tool vendors Teledyne and SANBlaze in their efforts to develop their own OCP test suites based on the verification test cases Microsoft creates directly from the OCP specifications.



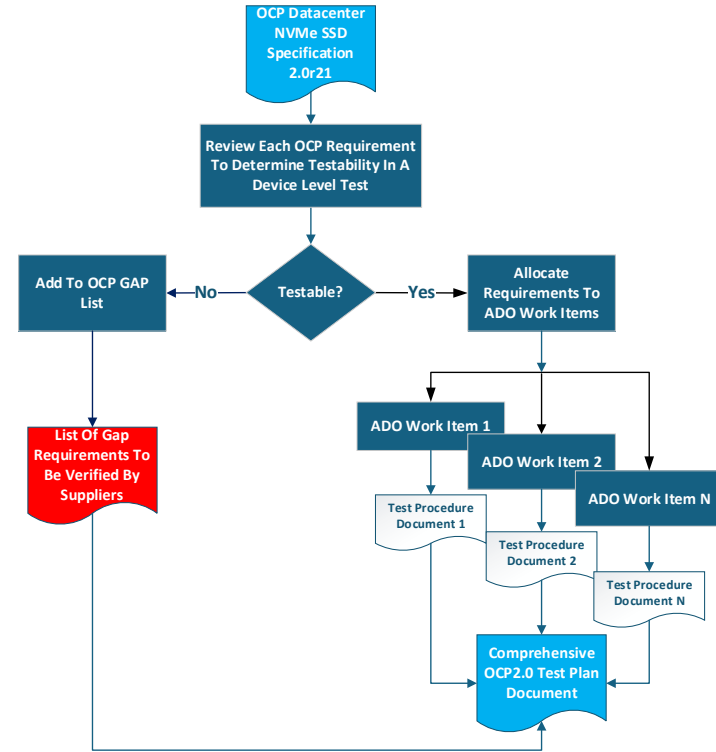
Intro and Background

- To gain greater industry acceptance by SSD suppliers, Microsoft decided in 2024 to begin work towards gaining official OCP support for the test cases that Microsoft has defined by submitting them to the OCP org for review and approval.
- To simplify the submission and review process, the OCP test cases have been merged into a single Comprehensive OCP Test Plan document that will be submitted to the OCP Steering Committee sometime in 2024.
- This OCP2.0 Test Plan targets validating the testable requirements defined in the Datacenter NVMe SSD Specification Version 2.0r21 and any in the previous NVMe Cloud Specification v1.0 that were not superseded.
- Microsoft is actively defining tests for the latest NVMe SSD Specification Version 2.5.



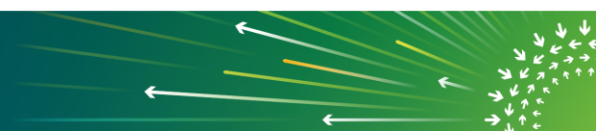
Overview of OCP Test Plan Creation Process

- Each requirement in the OCP specification is evaluated for testability.
- Requirements that can be validated in a device level test are allocated to Azure Dev Op work items for test case description and definition.
- Requirements that cannot be validated in a device level test are allocated to the Gap Coverage list of requirements to be verified by the SSD supplier.
- A test procedure document is created and linked to each work item. The document is used to define the individual test cases necessary to validate the allocated requirements.
- Each test case is defined at the NVMe protocol level.
- All test procedure documents are combined as chapters into a single comprehensive test plan document.



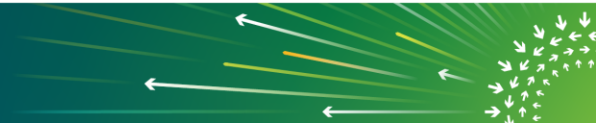
Breakdown Of an OCP Test Procedure

- Test case descriptions section:
 - Lists the requirements allocated to the test procedure.
 - Contains a description subsection for each test case.
 - Each test case subsection provides a high-level description of the objectives and actions of that test case.
- Test case definitions section:
 - Definition section contains a definition subsection for each test case.
 - Starts with a preconditioning callout for any required test setup to be done in advance.
 - Main body is the detailed set of NVMe level action/verification test steps.
 - Ends with a post condition callout detailing any post processing required to recover or return the drive to its original state.
- Many test cases use Adaptation data:
 - Adaptation data allows the defined set of tests to be used for any suppliers' SSD by tailoring to the unique characteristics of the device. Adaptation data is created by the SSD suppliers in accordance with the Adaptation data specification and is input during OCP testing.



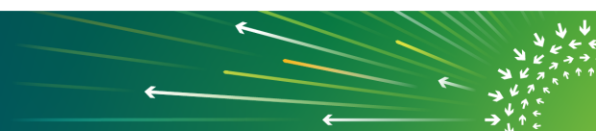
Benefits of Adopting OCP SSD Req and OCP Testing

- A few benefits of adopting OCP:
 - OCP is an open-source standard whose adherence yields well defined, predictable and robust SSD behavior.
 - SSD suppliers can use the Recovery Workflow defined in the OCP Vendor Unique Error Recovery Log Page to ensure predictable error handling for common SSD problems.
 - OCP defines robust and well-defined Telemetry that can be used for failure analysis over time and ultimately leading to a future failure prediction capability using AI.
 - OCP Latency Monitoring testing can expose both host and device issues that are otherwise hard to find.
 - OCP provides for a very robust security architecture.
 - SSD vendors supporting OCP can apply to have their products listed on the Marketplace of the OCP website.
- A few benefits of using standardized OCP Testing:
 - Allows SSD suppliers to do a quality Shift-Left through the early detection of bugs and performance issues.
 - Allows SSD suppliers to identify hardware limitations and plan for future remediation.
 - OCP Error Injection testing allows the actual error handling code paths in firmware to be exercised.
 - SSD suppliers can submit OCP test results when applying to add products to the OCP Marketplace.



Next Steps

- Continue driving refinement of the OCP2.0 Comprehensive Test Plan incorporating feedback and updates as needed.
- Continue Initiative driving development of the OCP2.5 Comprehensive Test Plan with a target date of 1st quarter 2025.
- OCP2.0 test services are now commercially available through Austin Labs and UNH IOL.
- Once the test plan has been accepted by the OCP org, OCP team members will be welcomed and encouraged to join Microsoft in driving the continued refinement and development of future OCP test plans.
- I am available for post panel discussions.



Storage Track



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SANBlaze OCP Test Solutions

Rick Walsh

Sr. Vice President

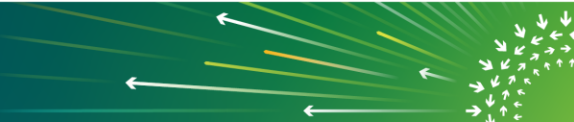


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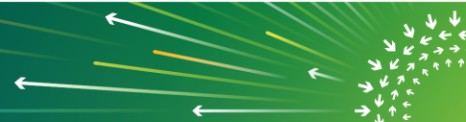
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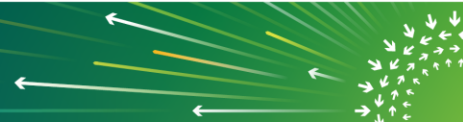
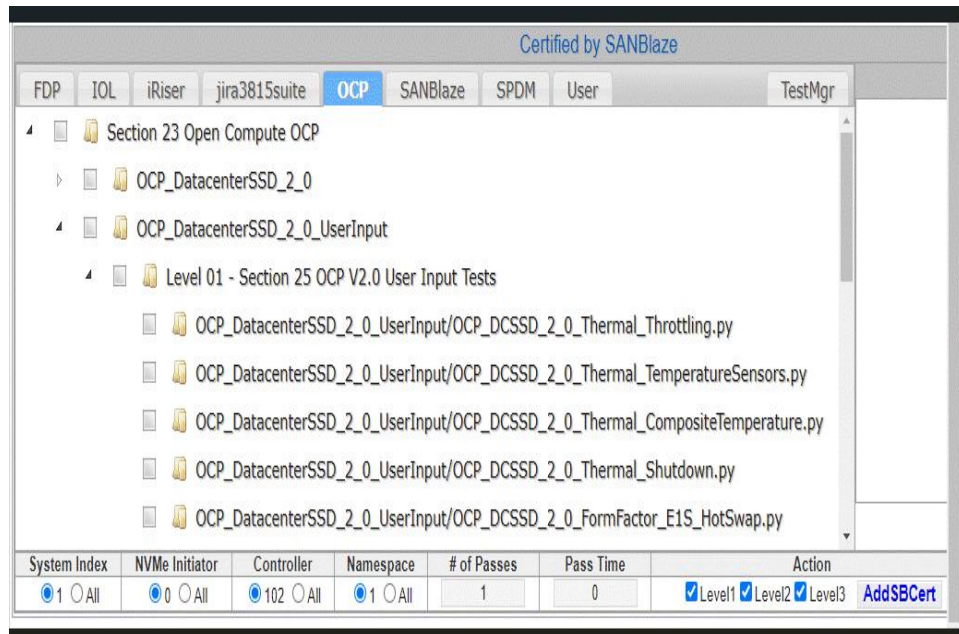
SANBlaze

- OCP 2.0 and 2.5 Target Test Platforms for Data Center SSD's
- Hardware supports up to 16 Single/Dual Port SSD's
 - Desk top Platform
- OCP Test Requirements Test Suite at the users fingertips
- Follows full Test Plan Requirements as specified by Microsoft
 - Data Center 2.0/2.5 spec for SSD's





- OCP 2.0 and 2.5 Target Test Platforms for Data Center SSD's
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- OCP Test Plan Requirements
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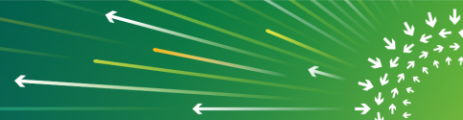
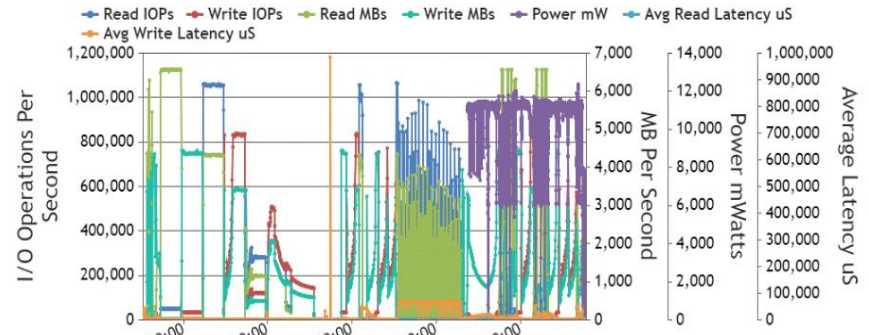


- OCP 2.0 and 2.5 Target Test Scenario's
 - Pass
 - Fail
 - Warning
 - Skip
- To have full OCP “Conformance” a drive parameter file must be used-
 - “Conformance” Based on the SANBlaze Test IP
 - Establishes what the SSD is supposed to support

Summary of All Tests in Selected Sections						
	Available	Run	Pass	Fail	Warning	Skipped
Level 1:	118	118	53	20	8	37
Level 2:	0	0	0	0	0	0
Level 3:	0	0	0	0	0	0
All Levels	118	118	53	20	8	37

IO Versus Power Plot

SANBlaze NVMe I/O Versus Power





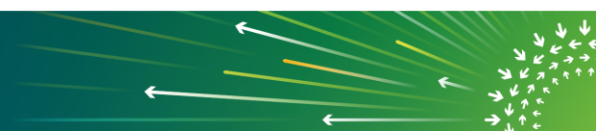
- OCP 2.0 and 2.5 Target Test Scenario's
 - Full Test Log report
 - Exactly what the steps were for a given test
 - Analyze Failures and Resolve
- Industry Goal of Consistency and reliability
 - SSD Industry Benchmark Requirements for the Data Center
 - UNH/IOL Test Services-Available w/SANBlaze Test Suite

13	241024	OCF_DCSSD_2_0_FormatNVM_CryptoErase.py	Passed	0/0	1/1	157	Aug01_12:20:47	Aug01_12:23:26	536870912000	2684354
14	241026	OCF_DCSSD_2_0_Sanitize_BlockErase.py	Passed	0/0	1/1	226	Aug01_12:23:28	Aug01_12:27:15	805308465152	2684354
15	241028	OCF_DCSSD_2_0_Sanitize_CryptoErase.py	Passed	0/0	1/1	226	Aug01_12:27:17	Aug01_12:31:05	805308465152	2684354
16	241030	OCF_DCSSD_2_0_Sanitize_OverwriteErase.py	Skipped	0/0	1/1	0	Aug01_12:31:06	Aug01_12:31:08	0	0
17	241032	OCF_DCSSD_2_0_Sanitize_CmdsReceivedDuringSanitize.py	Failed	1/0	1/1	17	Aug01_12:31:09	Aug01_12:31:28	4633001984	4632739
18	241034	OCF_DCSSD_2_0_Sanitize_FailedOperations.py	Passed	0/0	1/1	515	Aug01_12:31:29	Aug01_12:40:06	32212254720	1930587
19	241036	OCF_DCSSD_2_0_IO_Commands.py	Passed	0/0	1/1	796	Aug01_12:40:08	Aug01_12:53:26	941293043712	1709917
20	241038	OCF_DCSSD_2_0_IO_WriteZeros.py	Failed	1/0	1/1	0	Aug01_12:53:27	Aug01_12:53:29	0	0
21	241040	OCF_DCSSD_2_0_IO_Compare.py	Failed	1/0	1/1	0	Aug01_12:53:30	Aug01_12:53:32	0	0
22	241042	OCF_DCSSD_2_0_IO_WriteUncorrectable.py	Skipped	1/0	1/1	0	Aug01_12:53:33	Aug01_12:53:35	0	0
23	241044	OCF_DCSSD_2_0_CmdTimeout_AdminCmdTime.py	Warning	0/0	1/1	19	Aug01_12:53:37	Aug01_12:53:58	0	4564451
24	241046	OCF_DCSSD_2_0_CmdTimeout_AdminCmdExtendedTime.py	Passed	0/0	1/1	3	Aug01_12:54:00	Aug01_12:54:04	0	0
25	241048	OCF_DCSSD_2_0_CmdTimeout_IOCcmdTime.py	Passed	0/0	1/1	18075	Aug01_12:54:05	Aug01_17:55:22	43501190832128	2667409
26	241050	OCF_DCSSD_2_0_LogPage_ErrorInfo.py	Passed	0/0	1/1	25	Aug01_17:55:23	Aug01_17:55:49	0	0
27	241052	OCF_DCSSD_2_0_FWSlotInfo_LogPage.py	Warning	0/0	1/1	0	Aug01_17:55:50	Aug01_17:55:52	0	0
28	241054	OCF_DCSSD_2_0_LogPage_CmdsSupportedEffects.py	Passed	0/0	1/1	3	Aug01_17:55:53	Aug01_17:55:58	0	0
29	241056	OCF_DCSSD_2_0_LogPage_PersistentEvents.py	Failed	1/0	1/1	118	Aug01_17:56:00	Aug01_17:58:00	0	0
30	241058	OCF_DCSSD_2_0_LogPage_SMART.py	Passed	0/0	1/1	20	Aug01_17:58:01	Aug01_17:58:23	0	0
31	241060	OCF_DCSSD_2_0_LogPage_SMART_VolatileMem_BackupDev_Failure.py	Skipped	0/0	1/1	0	Aug01_17:58:25	Aug01_17:58:25	0	0
32	241062	OCF_DCSSD_2_0_LogPage_SMART_UnsafeShutdowns.py	Passed	0/0	1/1	185	Aug01_17:58:26	Aug01_18:01:34	0	0
33	241064	OCF_DCSSD_2_0_LogPage_SMART_WriteRead.py	Passed	0/0	1/1	3903	Aug01_18:01:35	Aug01_19:06:40	4618527068160	5279968
34	241066	OCF_DCSSD_2_0_LogPage_SMART_LittleEndian.py	Passed	0/0	1/1	3954	Aug01_19:06:41	Aug01_20:12:37	2544361062400	2544361
35	241068	OCF_DCSSD_2_0_LogPage_SMARTExtended_Persistence.py	Passed	0/0	1/1	619	Aug01_20:12:38	Aug01_20:23:00	0	0
36	241070	OCF_DCSSD_2_0_LogPage_SMARTExtended_Endianness.py	Passed	0/0	1/1	0	Aug01_20:23:01	Aug01_20:23:02	0	0
37	241072	OCF_DCSSD_2_0_LogPage_SMARTExtended_UnitsRW.py	Passed	0/0	1/1	620	Aug01_20:23:03	Aug01_20:33:25	1073741824	1073741



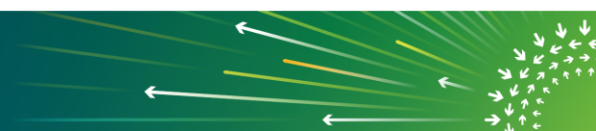
Industry Storage Consistency

- Benchmark level of Data Center Drive Metrics
 - While not an officially sanction program or certification
 - SANBlaze Offers a test methodology to insure OCP standards and requirements are met
 - Supporting the Microsoft Test Plan Requirements for 2.0 and 2.5
- SANBlaze Test IP is available directly from SANBlaze or Test Services can be contracted through UNH/IOL
 - Test IP in either form is available NOW!
 - 2.0 is released
 - 2.5 in Beta
- Hardware Platforms
 - RM5- 16 drive solution/Scaled Testing
 - DT5- 4 drive Solution
 - IP is the same across both platforms



Industry Storage Consistency

- Where to find additional information (URL links)
 - <https://www.sanblaze.com>
 - <http://unh.iol.edu>
- OCP Professional Services
- https://www.opencompute.org/solutions?solutions%5BrefinementList%5D%5Bsolution_provider%5D%5B0%5D=SANBlaze%20Technology%20Inc
- OCP Market Place/Products - Storage Testing
- https://www.opencompute.org/products?cloud_products%5BrefinementList%5D%5Bsolution_provider%5D%5B0%5D=SANBlaze%20Technology%20Inc



Storage Track



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Teledyne LeCroy OCP Solutions

Nick Kriczky

VP – Products and Services

Nick.Kriczky@Teledyne.com



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Teledyne LeCroy



Extensive range of tools for electrical, physical, logical and protocol layer testing

Protocol Analyzers and Test Appliances

Oscilloscopes

Electronic Test Equipment

Modular Data Acquisition

Sensors and Calibrators



Broad array of test solutions for serial data standards and next-gen technologies



Expert-level testing services and world-class training and educational services

Seminars and Webinars

Austin Labs Testing and Training

Frontline Test Services

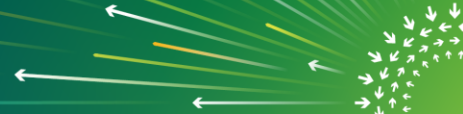
Consulting

Device and Systems Testing

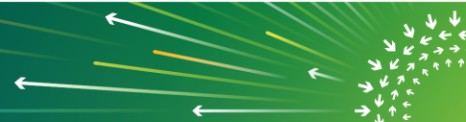
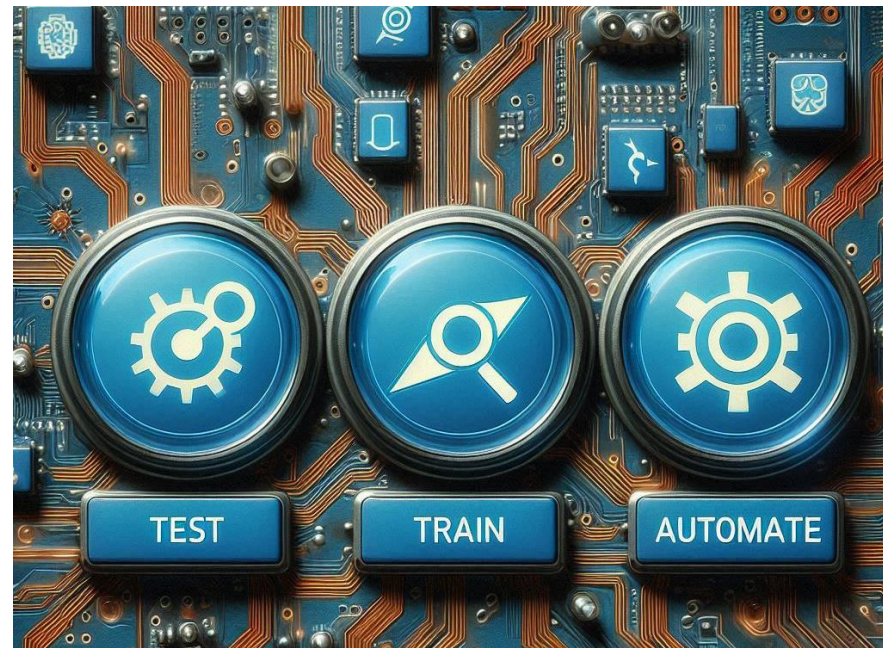


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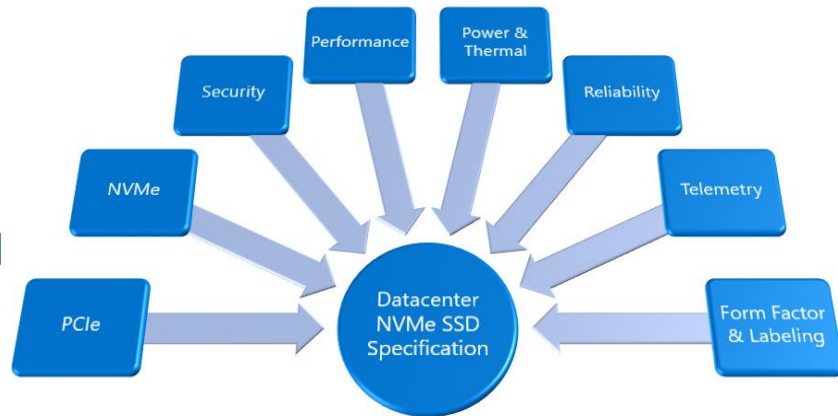


- Third Party Testing to provide OCP Compliance as a Service
- In-depth Protocol training for NVMe and PCIe specifications
- Automation of tests to simplify the process of OCP compliance

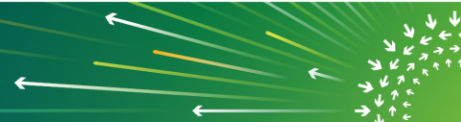


OCP for Datacenter NVMe SSD's

- Collaborative Specification
 - Driven by Microsoft, Meta, Dell, HPE, Google
 - Complimentary to NVMe Specifications
 - Aligns SSD Requirements between OEMs and SSD companies
 - Drives test development and automation
 - Enables focus on “customer” requirements
 - More efficient SSD Development – saves money
 - Enables 3rd party test development
 - Aligns drive vendors on specific cloud-based SKU's
 - More Features, Better Quality, and Faster Delivery

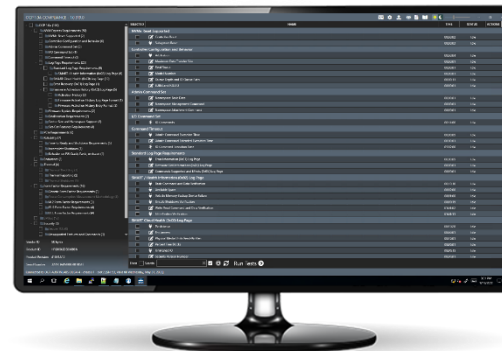
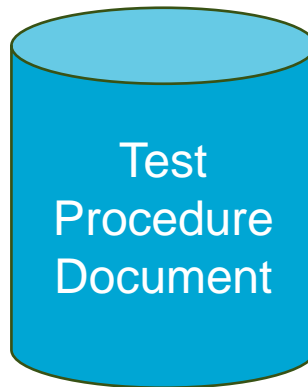
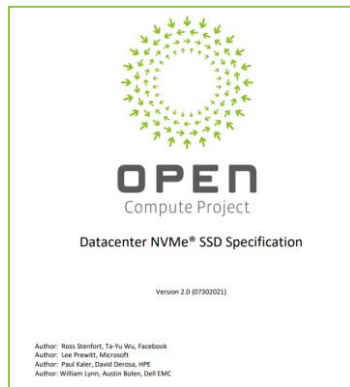


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How are the tests defined?

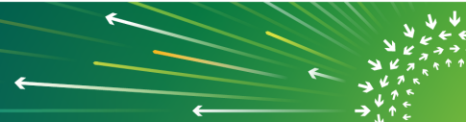
- Review of each OCP requirement for testability
- Creation of Test Procedure Document
- Feedback from SSD Suppliers
- Fully automated test solution



OCP 1.0a, 2.0, 2.5 Tests

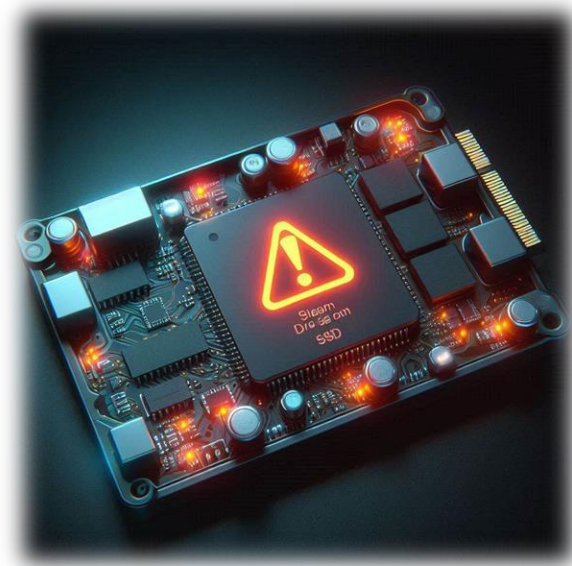
- OCP 1.0a ~100 tests
- OCP 2.0 ~140 tests
- OCP 2.5 Available Today
 - Adding tests as they become available from Microsoft

Software Features			
NVMe Tests	Form Factor Tests	Endurance Tests	PCIe Tests
• NVMe Resets	• Generic Form Factor	• Endurance Data	• PCIe Maximum Payload
• NVMe Controller Configuration & Behavior	• M.2 Form Factor	• End of Life	• PCIe TLP Completion Timeouts
• NVMe Admin Command Set	• E1.S Form Factor	Thermal Tests	• PCIe Resets
• I/O Command Set	• E1.L Form Factor	• Throttling	• Boot
• Command Timeout	• Power Management	• Reporting	• PCIe Logging
• Log Page Requirements	SMBus Tests	• Shutdown	• Low Power Modes
• Firmware Updates	• SMBus Verification • Codes	Labeling Tests	Reliability Tests
• Deallocation	• SMBus Firmware Update Notification	• Manual Inspection	• PERST
• Sector Size and Namespace Support	• SMBus Data Verification	• Barcodes	• Controller Status Ready
• Set/Get Features	Security Tests	• Identify Command	• Shutdown Notification and Status
	• Unsupported Command Verification	Endurance Tests	• Device Stability and Data Integrity
	• Unsupported Feature Verification	• Endurance Data	• Fatal Status
	• Unsupported Log Page Verification	• End of Life	• Incomplete Shutdown
	• Secure Boot		

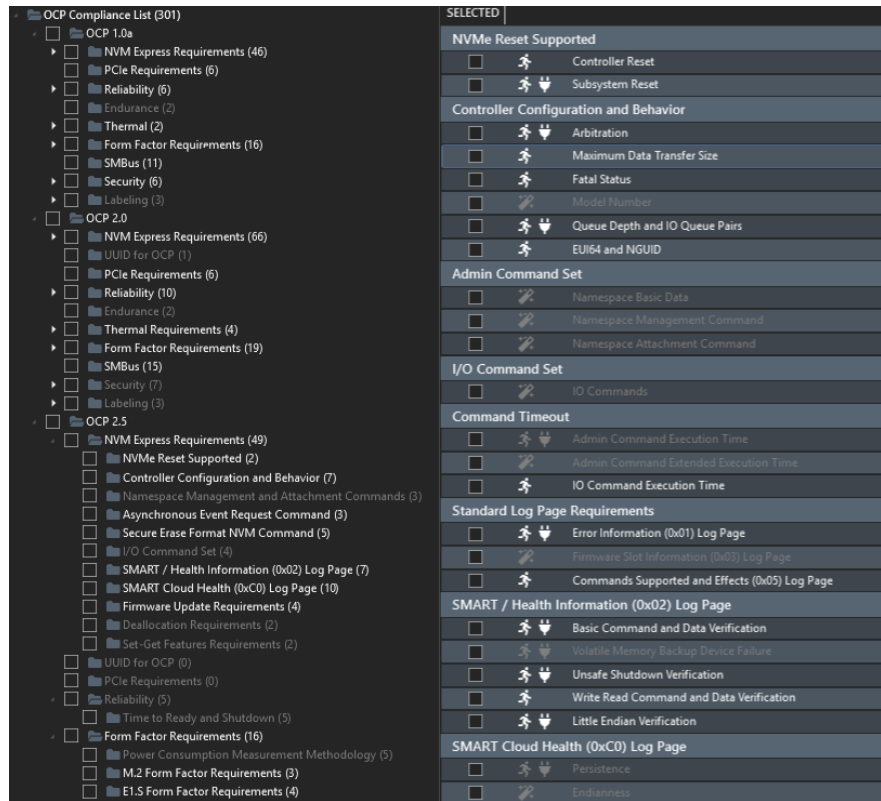


What is new for OCP 2.5

- Security
 - TCG
- Telemetry
 - Decode
 - Evaluate and root cause problems
 - Determine the right next step when errors occur
- Debuggability
 - Smart Logs
 - Health Information
 - Latency Monitor
- Feedback from drive vendors
- Upgrades and bug fixes



OCP Compliance Test Tool Suite



- Simple Easy to use GUI
- Provides Pass/Fail Results
- Full Logging and Debug
 - Logs can be provided to OEM's
 - Validates qualification to spec
- Fully automated through GUI and through scripting
- Tested and approved by Microsoft
- Ability to add customized tests to support other OCP gap requirements



Oakgate OCP Test Platform

- Desktop appliance or rackmount solution
- Capacities up to 48 SSDs
- PCIe 4.0 and 5.0
- U.2, M.2, U.3, CEM, EDSFF E1.S or EDSFF E3.S/L SSDs
- Traffic Generation
- Error Injection
- Power Measurements and Cycling



Austin Labs – OCP Experience Center

OCP Experience Centers seed emerging markets by allowing potential adopters to see and understand OCP equipment, channel and system integrators to conduct presales and engineers to develop new pre-product concepts.

OCP Experience Center (Austin, TX) - Hosted by Teledyne LeCroy

With state-of-the-art test facilities located around the world and industry expertise Austin Labs takes advantage of the wide array of Teledyne LeCr...

Solution Provider: Teledyne LeCroy

Model #: OCP Experience Center (Austin, TX) - Hosted by Teledyne LeCroy



OCP

Experience Center

Austin, TX, USA



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Where can I find more information?

- [Teledyne LeCroy - All OCP Solutions](#)

<https://www.teledynelecroy.com/protocolanalyzer/ocp.aspx>

- [OCP Marketplace](#)

https://www.opencompute.org/products?cloud_products%5Bquery%5D=lecroy

- [Austin Labs](#)

<https://www.teledynelecroy.com/services/austinlabs-testing.aspx>

- [Oakgate Technologies](#)

<https://www.teledynelecroy.com/ssdtesting/>

- [UNH-IOL](#)

<https://www.iol.unh.edu/testing/storage/nvme/tools>

Results: All ☆ Favorites

Sort by: Relevance ▾

Teledyne LeCroy - OCP Compliance Test Suites 1.0a and 2.0

Teledyne LeCroy is a leading provider of test, validation, and benchmarking test platforms to the storage industry. Based on OCP v1.0a and 2.0 Com...

Solution Provider: Teledyne LeCroy

Model #: Teledyne LeCroy - OCP Compliance Test Suites 1.0a and 2.0

[Associated Approved OCP Contributions](#)



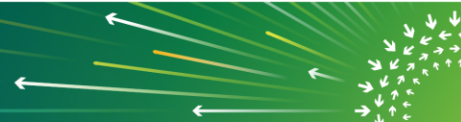
Teledyne LeCroy - OakGate SSD Test Solutions

Teledyne LeCroy is a leading provider of test, validation, and benchmarking test platforms to the storage industry. Ability to run the Teledyne LeCroy ...

Solution Provider: Teledyne LeCroy

Model #: Teledyne LeCroy - OakGate SSD Test Solutions

[Associated Approved OCP Contributions](#)



Call to Action - Collaboration

- OCP Specification is continuing to grow
 - Connect
 - It takes all of us from the OEM/Hyperscale companies to the SSD suppliers to the tool manufacturers for success
 - Collaborate
 - I am inviting you to be a part of the test requirements
 - We improve our products through you!
 - Accelerate
 - We are working together to solve the challenges for tomorrow

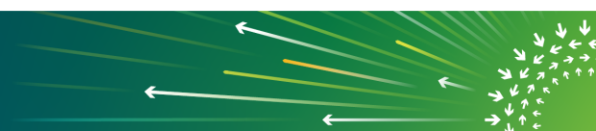


OPEN
Compute Project®

Connect

Collaborate

Accelerate



Thank you!

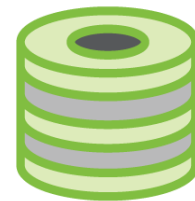


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Storage



STORAGE

Open Source Testing

OCP Storage Test Repository

Vineet Parekh, Meta



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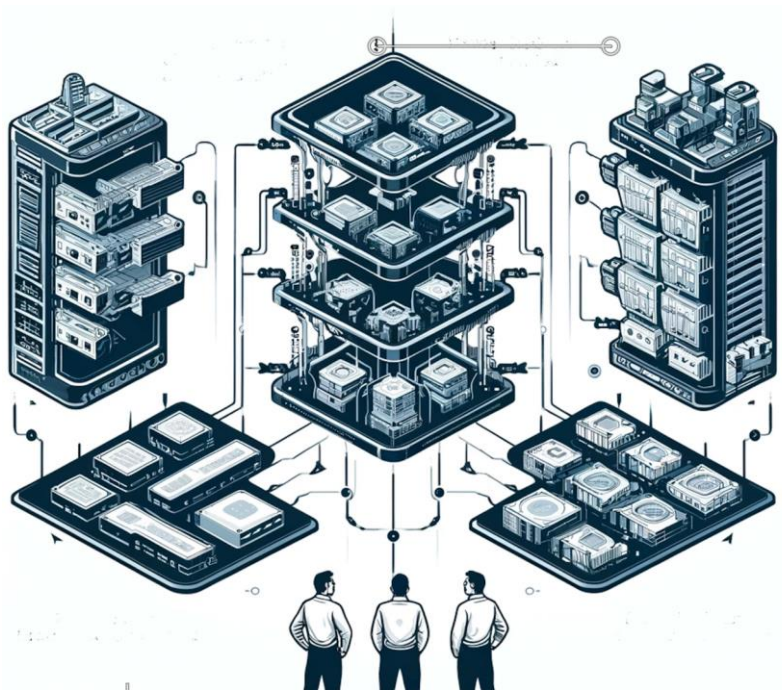


Imagine a World....

Where open sourcing tests becomes an innovation cornerstone
for seamless and efficient qualifications



The Current State of SSD Qualification



Diverse Approaches: Each hyperscaler, including Meta with its Hi5 tool, employs unique automation frameworks tailored to their specific operational needs.

Vendor Integration: Vendors face significant challenges adapting these frameworks, requiring extensive setup and support, often resulting in inefficiencies in deployment and testing processes.

Resource Allocation: The necessity for each hyperscaler to maintain individual support teams for framework implementation and troubleshooting showcases the resource-intensive nature of current practices.

Meta Solution: Open Sourcing Tests

Open-Source Collaboration: Meta proposes the adoption of an open-source testing strategy that SSD Customers, SSD Suppliers and the industry in general can contribute to and utilize.

Reduced Complexity and Costs: By harmonizing the testing procedures, we reduce the need for multiple custom solutions. This simplifies vendor integration, decreases the demand for extensive support, and cuts operational costs.

Accelerated Innovation: Efficient qualification will lead to faster time to market.





The Future Has Arrived....

Meta test framework and storage qualification tests are now available at OCP Github Repository!

Meta OCP Framework

<https://github.com/opencomputeproject/ocp-diag-autoval>

Meta OCP Storage Tests

<https://github.com/opencomputeproject/ocp-diag-autoval-ssd>

OCP Blog Page Announcement

🏠 > Blog > Introducing Meta's Open Source...

Introducing Meta's Open Source Testing Framework: Revolutionizing SSD Qualifications

Tuesday, July 09, 2024 - Posted by Vineet Parekh, Ross Stenfort, Jan Seidel, Adrian Enache, Dhankaran Singh Ajravat

The landscape of Solid State Drive (SSD) qualifications is poised for a transformative shift with today's launch of Meta's new Open Source Testing Framework and Storage Tests. Available on the OCP Github Repository, this initiative represents a significant leap towards enhancing operational efficiency and fostering innovation across the storage technology sector.



The Pressing Need for Change

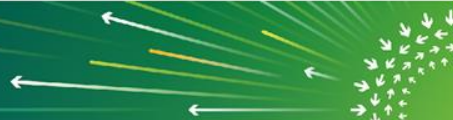
Traditionally, SSD qualification processes have been cumbersome and isolated, with hyperscalers and other SSD consumers, including Meta, deploying custom-built automation frameworks. This has led to significant integration challenges for SSD manufacturers, extensive resource demands on hyperscalers, delayed qualification timelines and escalated operational costs. The fragmented nature of these processes highlighted the urgent need for a streamlined and unified efficient approach.

Meta's Innovative Open Source Solution



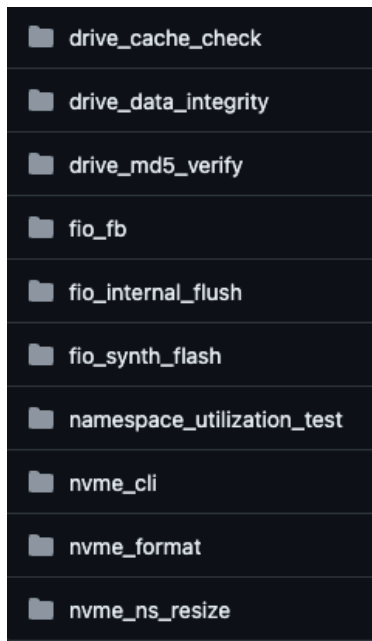
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AutoVal SSD Test Cases

- Test Cases v1
 - Main use case: SSD Drive Qualification



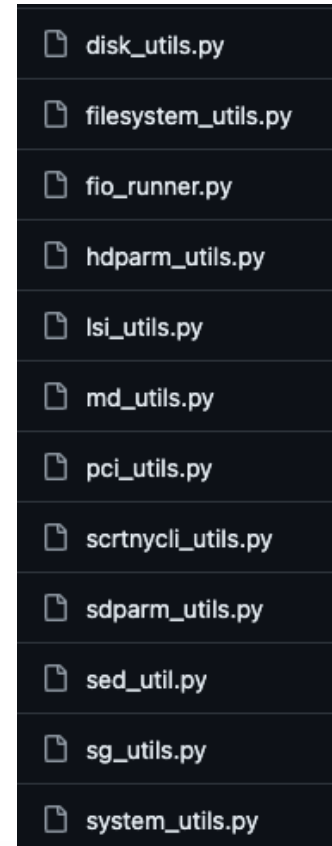
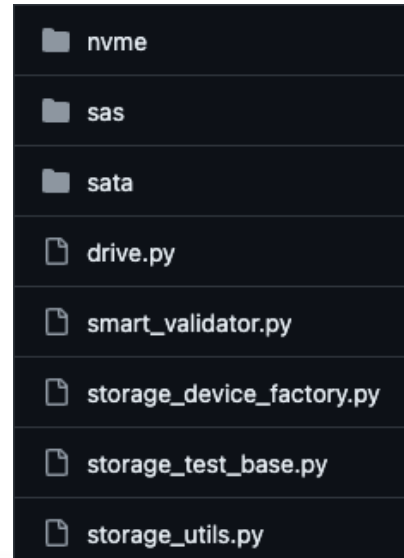
- Common Base class
 - Predefined setup / cleanup for storage tests

```
class StorageTestBase(TestBase):  
    """  
    Base class for testing drives.  
    - Create drive objects  
    - Compare and validate drive metrics at the end of the test
```



AutoVal Shared Libraries

- Reusable functionality between test cases
- Support for NVME / SAS / SATA drives



Call To Action

- **Invitation to Collaborate:** We invite industry players to join us in this initiative. Your expertise and insights are crucial to creating a more efficient and innovative future.
- **How to Get Involved:**
 - Utilize open-source test cases across the industry
 - Meta will provide a more detailed presentation and discussion in a future monthly storage meeting
 - Additional innovative ideas? Reach out to Vineet Parekh

Welcome to the start of a new world,
where open sourcing tests becomes an innovation
cornerstone for seamless and efficient qualifications



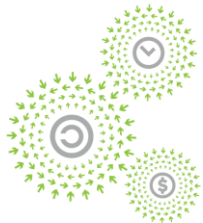
Storage



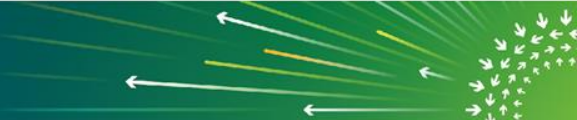
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NVMe SSD Qualification

Chris Sabol, Google



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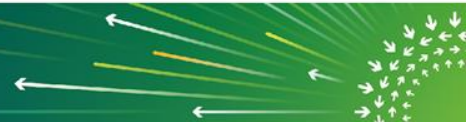


NVMe SSD Qualification Challenges

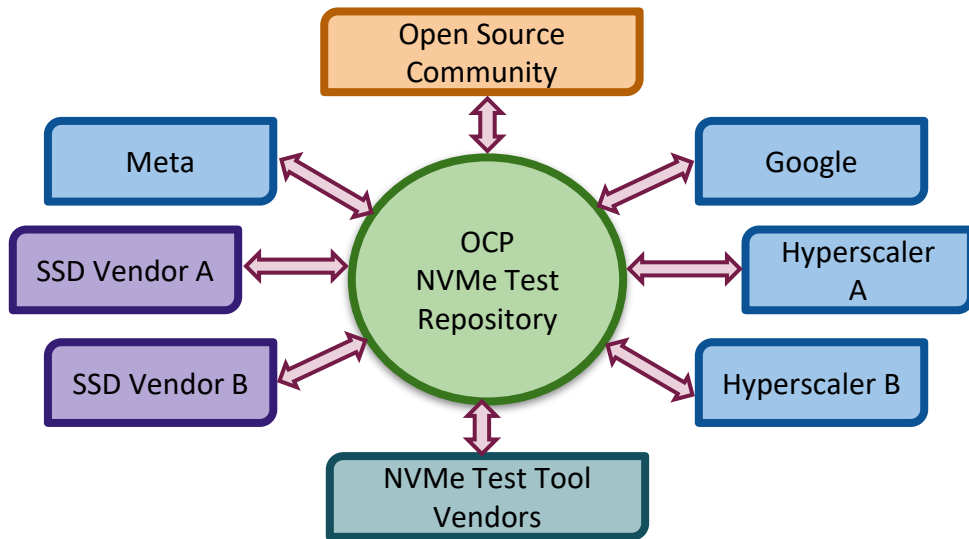
Challenges

- Increasing SSD features and requirements
- Resource and time consuming
- Testing coverage gaps
- Hard to debug production environment problems
- Not scalable across multiple SSD vendors and models

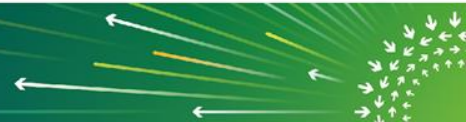
Google supports industry efforts to address these challenges together with an open test repository and more



NVMe SSD Qualification Approach



- Vendors and hyperscalers can **create tests**
- **Easy integration** to various infrastructures
- **Shared** across vendors, design partners, manufacturers, and hyperscalers
- Google has **contributed** initial tests at ocp-diag-ssd-qual



Storage



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Open Test Framework Contribution

Yaojie Li, ScaleFlux



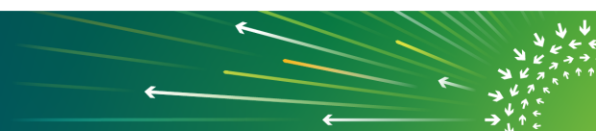
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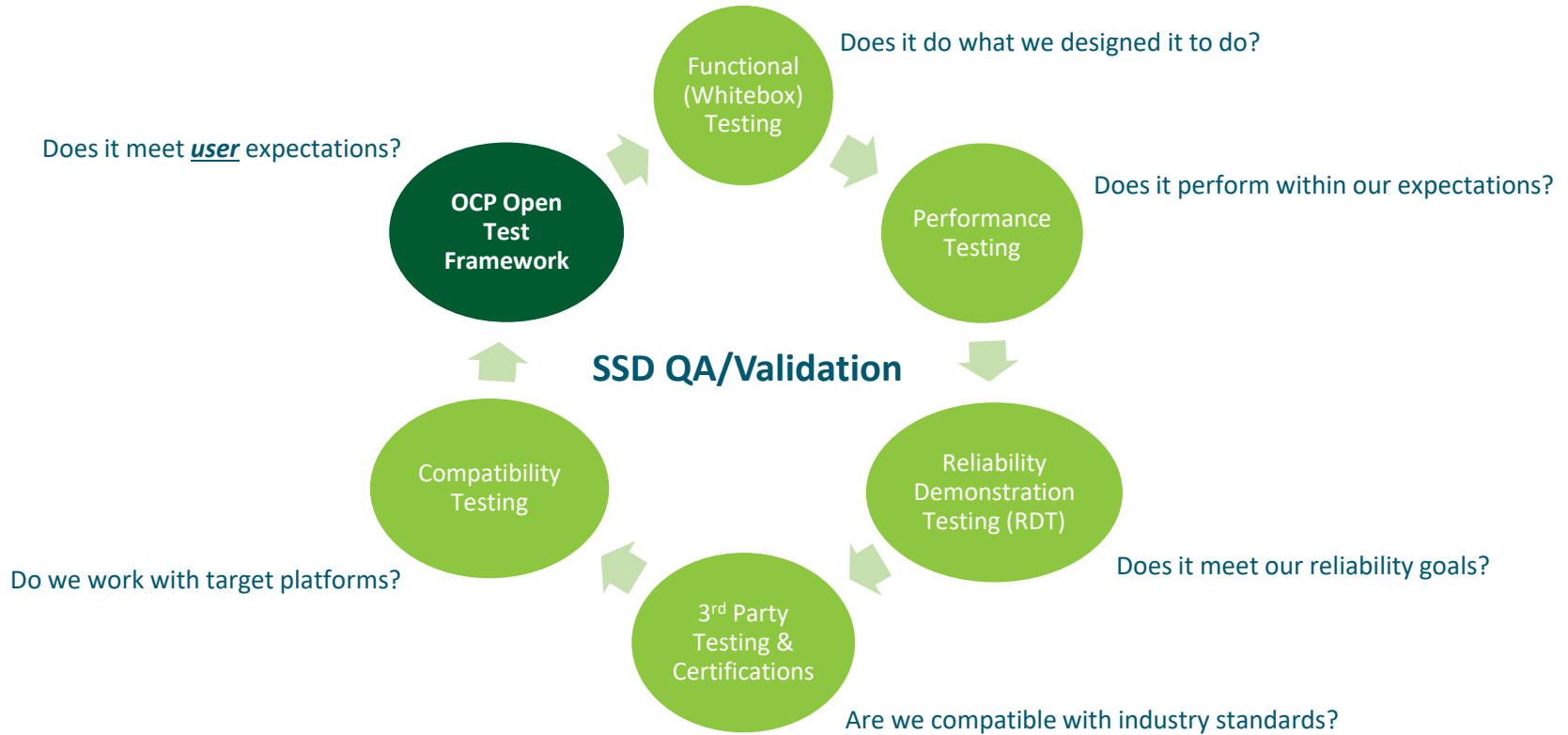


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The Open Test Framework allows us to pull-in testing that would normally be performed at qualification → Faster time to market

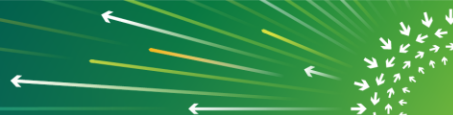


ScaleFlux Adoption

- ScaleFlux has integrated the Open Test Framework into QA workflows
- ScaleFlux intends to continue to support the Open Test community by contributing features and test cases
- We still have some warnings to clean up (WAF can indeed be less than 1.0)!

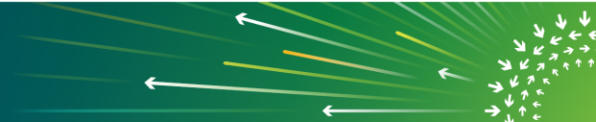
```
[08/04/2024 22:37:01] - Manufacturer
[08/04/2024 22:37:01] - GenericNVMe: nvme0n1
[08/04/2024 22:37:01] - Seagate: sda
[08/04/2024 22:37:01] - Model
[08/04/2024 22:37:01] - CSD-5310: nvme0n1
[08/04/2024 22:37:01] - ST1000DM010-2EP102: sda
[08/04/2024 22:37:01] - Type
[08/04/2024 22:37:01] - DriveType.SSD: nvme0n1
[08/04/2024 22:37:01] - DriveType.HDD: sda
[08/04/2024 22:37:01] - Interface
[08/04/2024 22:37:01] - DriveInterface.NVME: nvme0n1
[08/04/2024 22:37:01] - DriveInterface.SATA: sda
[08/04/2024 22:37:01] - Firmware_version
[08/04/2024 22:37:01] - U0021698: nvme0n1
[08/04/2024 22:37:01] - CC43: sda
[08/04/2024 22:37:01] - Fetching test drives.
[08/04/2024 22:37:01] - Available drives: [nvme0n1, sda], Drives under test: [nvme0n1]
```

```
[08/05/2024 12:49:42] - Lifetime WAF for drive nvme0n1 is 0.22802638160990424
[08/05/2024 12:49:42] - WARNING - 64 - WAF expected range - Actual: [0.22802638160990424] - Validation: [isWithinRange] - Expected: [Min: 1.0, Max: 20.0]
[08/05/2024 12:49:42] - WAF during this test for drive nvme0n1: 0.361494083682329
[08/05/2024 12:49:42] - Drive nvme0n1: {'lifetime_write_amplification': 0.22802638160990424, 'test_write_amplification': 0.361494083682329}
[08/05/2024 12:49:42] - Converting storage data for config check
[08/05/2024 12:49:44] - WARNING - 65 - Drive /dev/sda has errors: ['Error logging capability: (0x01)\tError logging supported.', ' 1 Raw_Read_Error_Rate POSR-- 081 08
006 - 158010752', ' 7 Seek_Error_Rate POSR-- 060 045 - 1085830', '184 End-to-End_Error -0--CK 100 100 099 - 0', '199 UDMA_CRC_Error
t -OSRCK 200 200 000 - 0', '0x10 GPL R/O 1 NCQ Command Error log', 'SMART Extended Comprehensive Error Log Version: 1 (5 sectors)', 'No Errors Logged',
T Error Recovery Control command not supported', '0x04 ---- = - --- -- General Errors Statistics (rev 1) ==', '0x04 0x008 4 0 --- Number of Repor
Uncorrectable Errors: ] - Actual: [false] - Validation: [isTrue] - Expected: [True]
[08/05/2024 12:49:45] - WARNING - 66 - Drive /dev/sda has errors: ['Error logging capability: (0x01)\tError logging supported.', ' 1 Raw_Read_Error_Rate POSR-- 081 08
006 - 158010752', ' 7 Seek_Error_Rate POSR-- 060 045 - 1085830', '184 End-to-End_Error -0--CK 100 100 099 - 0', '199 UDMA_CRC_Error
t -OSRCK 200 200 000 - 0', '0x10 GPL R/O 1 NCQ Command Error log', 'SMART Extended Comprehensive Error Log Version: 1 (5 sectors)', 'No Errors Logged',
T Error Recovery Control command not supported', '0x04 ---- = - --- -- General Errors Statistics (rev 1) ==', '0x04 0x008 4 0 --- Number of Repor
Uncorrectable Errors: ] - Actual: [false] - Validation: [isTrue] - Expected: [True]
[08/05/2024 12:49:46] - saving config results from storage_test_base at /autoval/results/localhost/FioSynthFlash/2024-08-04-22-36-34/config_results.json
[08/05/2024 12:49:46] - failed to collect test manifest data
[08/05/2024 12:49:46] - saving results at /autoval/results/localhost/FioSynthFlash/2024-08-04-22-36-34/test_results.json
[08/05/2024 12:49:46] - saving test steps at /autoval/results/localhost/FioSynthFlash/2024-08-04-22-36-34/test_steps.json
[08/05/2024 12:49:46] - +++Test Finished:
Test Summary: FioSynthFlash
Perform fio_synth workload on the entire capacity of each
drive. If drive_filter is mentioned, do either HDD only or all drives. Parameters: raid None test_drive_filter True synth_options None
Passed Steps: 56
Warning Steps: 10
```



Open Test Framework

- Ease to Use and Cost Efficiency
- Unify test and tools platform, reduce tedious proprietary tests per vendor.
- Collaboration and innovation



Open Discussion



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