NVMe Conformance and Interoperability

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Agenda

- **NVMe Test Program Overview**
- NVMe Integrators List
- Test Tools
- November 2014 NVMe Plugfest
- New Tests / IL Criteria

NVMe Test Program Overview

- NVMe Test Program is focused on a public Integrators List (IL) hosted by UNH-IOL

- NVMe Promoters group decides the criteria for a product to be on the Integrators List

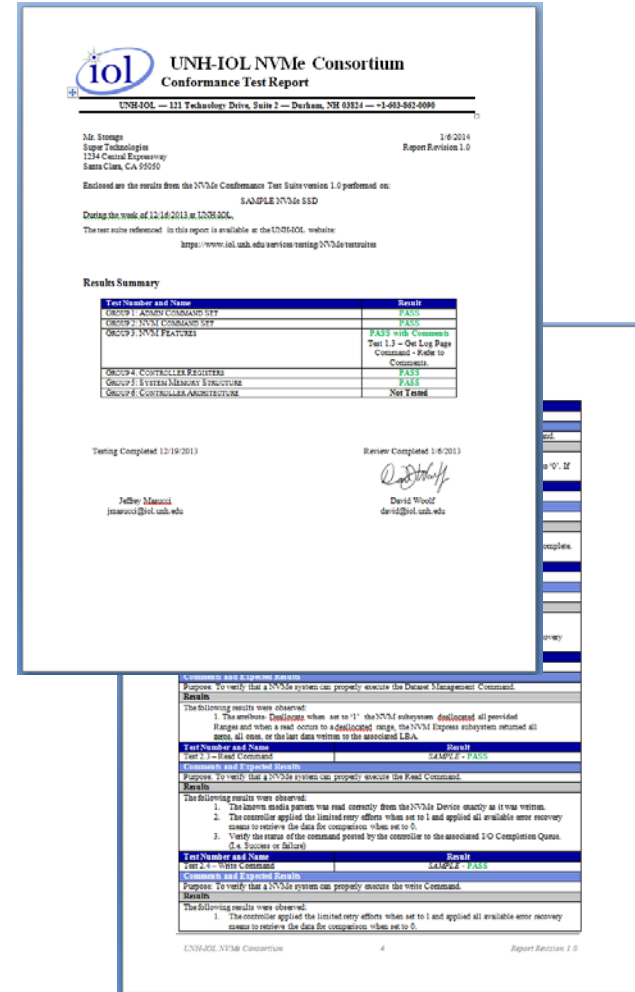- UNH-IOL performs the testing to determine if a product meets those qualifications

NVMe Test Program Overview

- Plugfest are the launch point for new IL requirements

- After the Plugfest, Testing for Integrators List continues at UNH-IOL as new products are released.

- UNH-IOL makes test tools available to members to enable conformance checking

Reporting

- UNH-IOL will use collected test data to produce Interop and Conformance Test Reports for all products at the Plugfest.

- Test Reports are necessary to list a product on the NVMe Integrators List.

- Reports are can be shared with partners and customers

Why UNH-IOL?

- Industry leading 3rd-party test facility for data, telecom, storage, networking, consumer electronics
- 100% funded by commercial industry

- 32,000 sq. ft lab facility – Boston, USA Metro Area
- 7,200 sq. ft pre-wired space dedicated to Plugfests

NVMe Test Program Overview

NVMe Promoters Group

- **Provides guidance** on services, tools, plugfests, Integrators List qualification requirements

UNH-IOL

- **Executes** test services and plugfests, **administers** Integrators List, and **develops** test tools

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NVMe Integrators List

- Hosted by UNH-IOL at www.iol.unh.edu
- Opt-in list of qualifying NVMe products
- Criteria for listing defined in NVMe Integrators List Policy document, found on IL Page
- Currently 15 products listed

https://www.iol.unh.edu/services/testing/NVMe/integratorslist.php

NVMe Integrators List

University of New Hampshire
InterOperability Laboratory

Improving networks worldwide.

| Services | Education | For Members |

Location: Home » Services » Testing » NVMe

NVMe Integrators List

This Integrators List (IL) contains information about NVMe Products that UNH-IOL has performed interoperability and conformance testing on. Successful completion of such conformance tests when combined with satisfactory operation in UNH-IOL's interoperability tests provides a reasonable level of confidence that the Product Under Test will function properly in many NVMe environments.
Products listed here have met the requirements of the NVMe Integrators List Policy:

NVMe Integrators List 1.1b

NVMe Integrators List Policy v1.1b

NVMe Integrators List 1.1

NVMe Integrators List Policy v1.1

NVMe Devices

Product	Product Type	Firmware Version	Interop Program Revision	Date Listed	Test ID	Further Info
Huawei uniSSD	NVMe SSD	v1.0	v1.1	3/10/14		http://www.huawei.com
Intel NVMe SSD Technology	NVMe SSD	8DV10036	v1.1	3/10/14		http://www.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-ssd.html
Mobiveil UNEX 64 bit NVMe Controller IP	NVMe SSD IP	1.0	v1.1	3/10/14		http://www.mobiveil.com/downloads/unex-pb.pdf
Mobiveil UNEX 128 bit NVMe Controller IP	NVMe SSD IP	1.0	v1.1	3/10/14		http://www.mobiveil.com/downloads/unex-pb.pdf
PMC Sierra Princeton	NVMe SSD Controller	1.0.0	v1.1	3/10/14		http://www.pmc.com

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NVMe Test Tools

UNH-IOL INTERACT PC Conformance Test Station
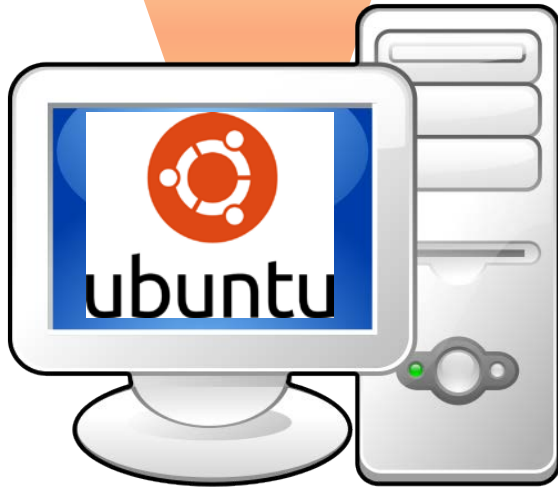
- Linux based NVMe Conformance Test Station uses:
  - tNVMe v.3.0 available from github (UNH-IOL admin)
  - IOL INTERACT 1.1 (available from UNH-IOL) **RELEASED July 29, 2014**
  - Ubuntu 10.10, 12.04, 13.04, 14.04

NVMe Test Tools
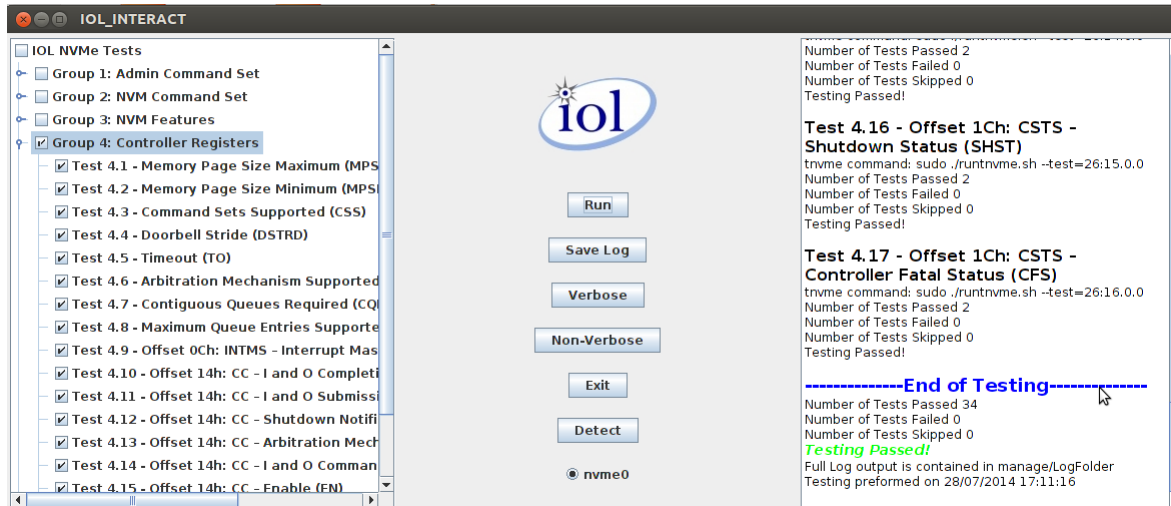
- IOL INTERACT PC Edition is the 'quick' way to check conformance to the existing NVMe conformance test suite.
- Does not have bus level analysis capability

NVMe Test Tools

UNH-IOL INTERACT Teledyne-LeCroy Conformance Test Station

- NVMe Conformance Test Station uses:
  - Teledyne LeCroy Summit Z3 Exerciser and Analyzer
  - Teledyne LeCroy Summit Z3 Software Build 6.75
  - IOL INTERACT Teledyne-LeCroy Edition 1.2 (available from UNH-IOL)
  - **RELEASED July 29, 2014**

TELEDYNE LECROY
Everywhere**you**look™

NVMe Test Tools

- IOL INTERACT Teledyne LeCroy Edition is the thorough way to check conformance to the NVMe Test Suite.

- Bus level analysis provides greater debug capability

NVMe Test Tools
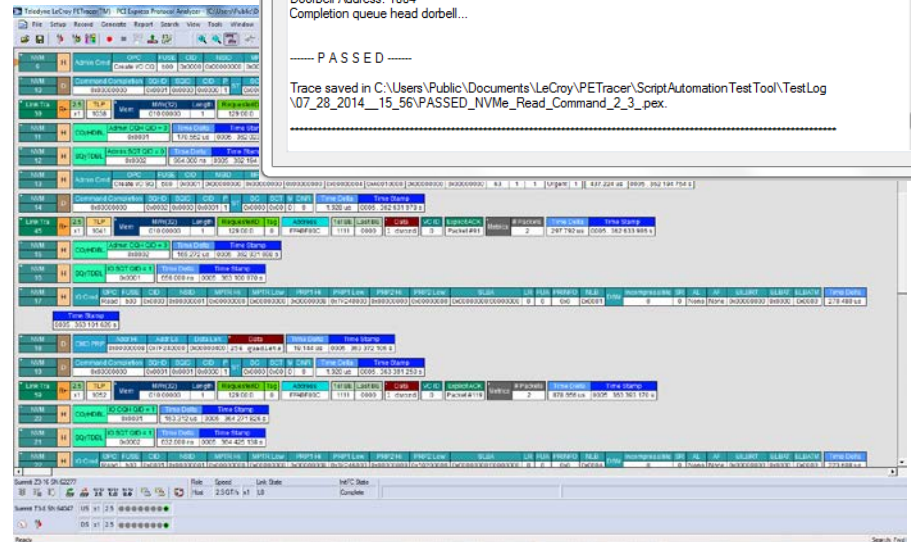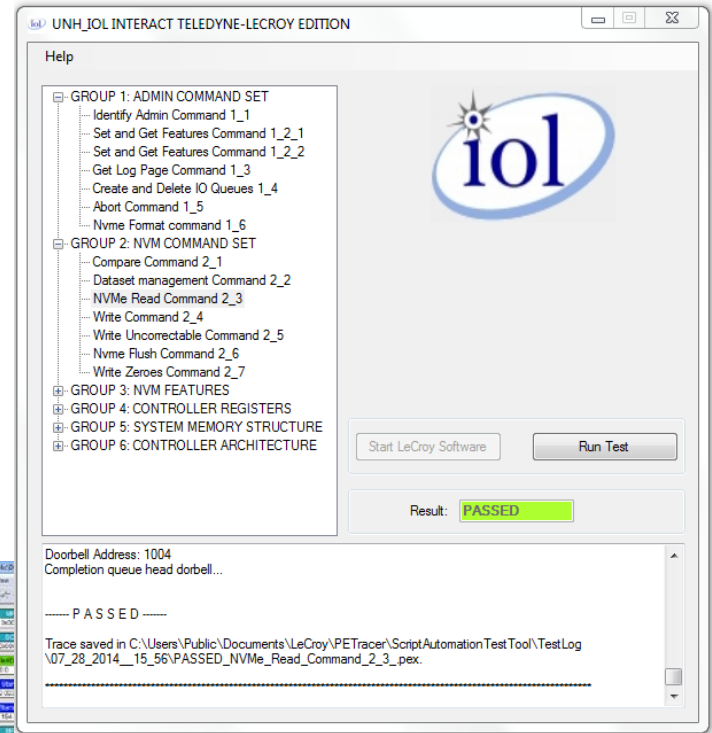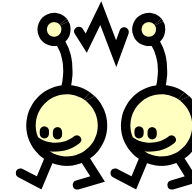
- ***Why 2 tools? Isn't that redundant?***
    - Community needs a tool with a relatively low cost barrier, to be able to determine conformance. The PC Edition meets that need.
    - Community also needs a tool with deep debug and analysis capability. Teledyne-LeCroy edition meets that need.
    - Tradeoff: Cost vs. Debug Capability + Trace Analysis

NVMe Test Tools
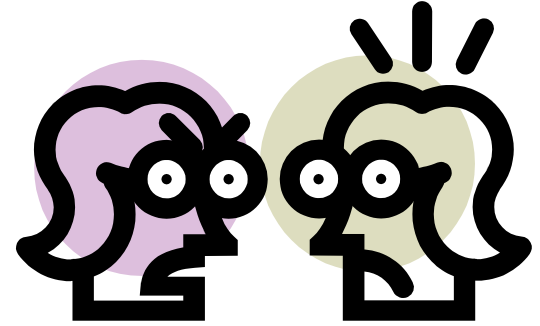
- ***What if the tools disagree?***
  - UNH-IOL has done correlation between these tools for all products that have come through our lab
  - If the tools disagree, UNH-IOL will examine the bus traces in detail to determine product pass/fail.
  - Updates then made to tool to rectify issue.
  - We're happy to examine traces you capture in your own lab.

NVMe Interop Test Tools

- **VDBENCH 5.04**
- Available at oracle.com
- Command Line utility for generating IO Workloads to disk.
- Java program works on Windows, Solaris, Linux stations.
- Download Parameter File for NVMe Interop Tests created by UNH-IOL:
    - *https://www.iol.unh.edu/services/testing/NVMe/unh_interop_1_1_linux.txt*
    - *https://www.iol.unh.edu/services/testing/NVMe/unh_interop_1_1_windows.txt*
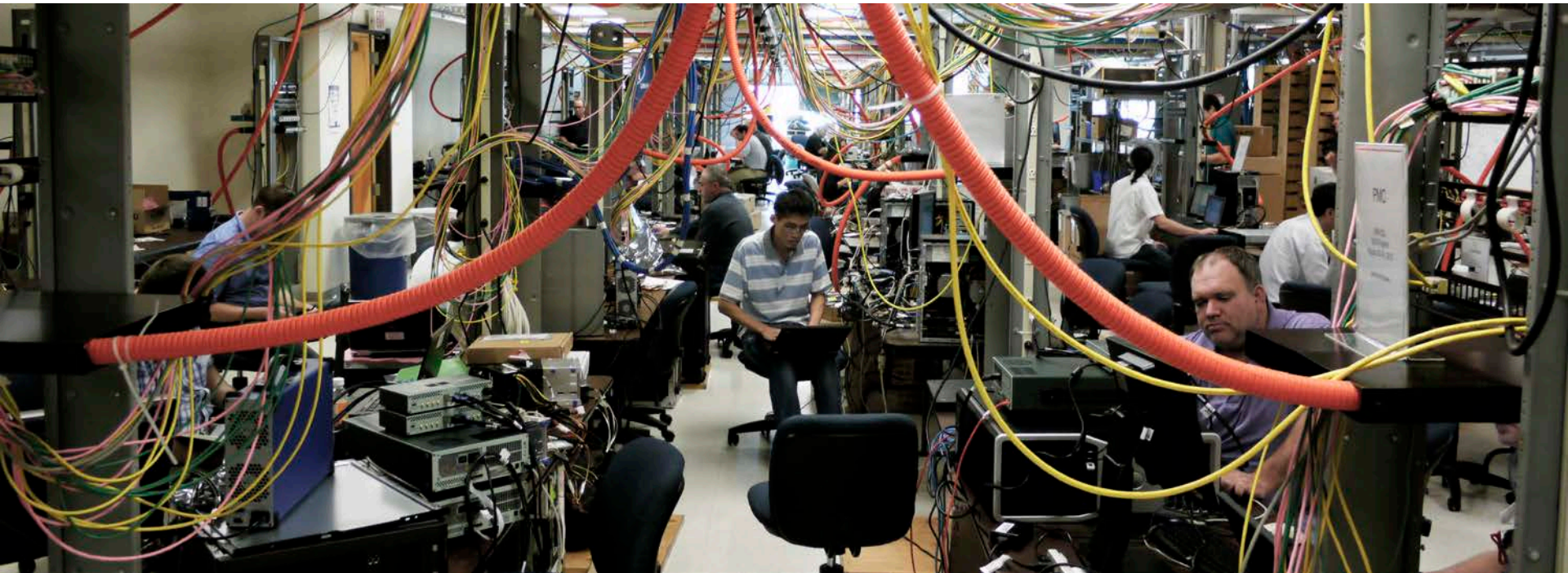
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NVMe Plugfest

UNH-IOL
November 10-13, 2014
Durham, NH USA

NVMe Plugfest

- Launch point for new IL 1.1b Requirements
- Expanded Interop Testing

- Register Now:

https://www.iol.unh.edu/services/testing/NVMe/plugfest.php

November 2014 NVMe Plugfest

UNH-IOL INTERACT PC Conformance Test Station

UNH-IOL INTERACT Teledyne-LeCroy Conformance Test Station

NVMe Conformance Test Station (FYI)

NVMe Conformance Test Station (FYI)

PCIe Phy Conformance Test Station (FYI)

SSD

HotPlug Interop Test Station (FYI)

FreeBSD 9.2

RHEL 6.5

UEFI Interop Test Station (FYI)

Ubuntu 12.04

Windows 8.1 Microsoft Driver

Windows Server 2012 R2 Microsoft Driver

Windows Server 2012 OFA Driver 1.3 or 1.4

Windows 7 OFA Driver 1.3 or 1.4

Interop Tests

- To handle disparate form factors, adapters may be used

PCI-AD-x439-01 adapter from Serial Cables

November 2014 NVMe Plugfest

- **Conformance Testing**
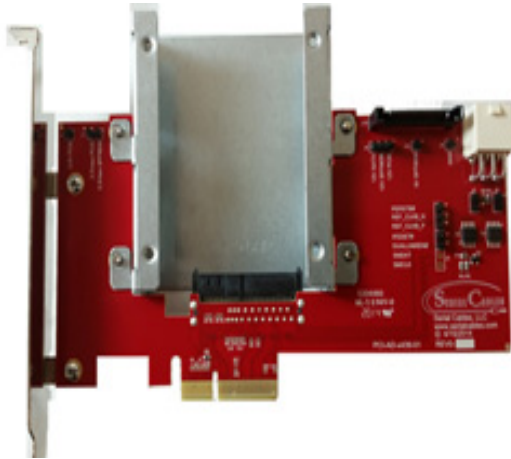 - Tests defined in NVMe Interop Test Suite document (publically available at www.iol.unh.edu)
  - Test tools used to check proper construction and response to different NVMe Stimuli
  - Admin Commands, NVM Commands, Controller Registers
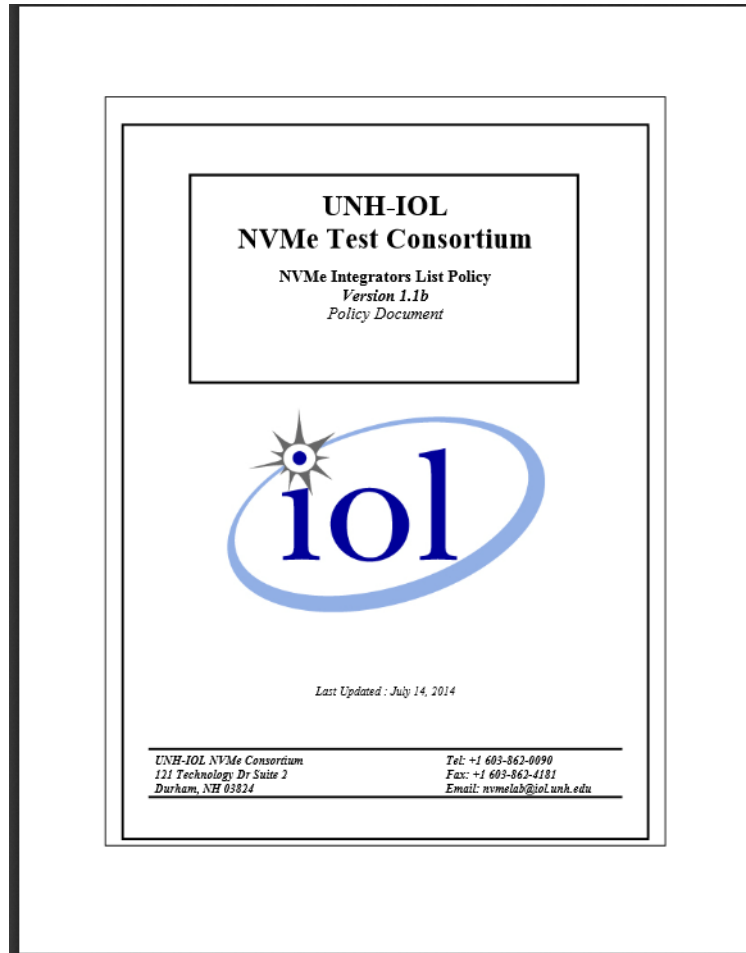
UNH-IOL INTERACT Teledyne-LeCroy Conformance Test Station

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New IL Criteria

- **Plugfest is launch point for new IL Qualification Requirements:**

Current 1.1 Program Requirements	Future 1.1b Program Requirements (November 2014)
Test with 5 products, pass with 4	Test with 6 products pass with 5
Pass with Windows or Linux reference driver	Pass with Windows and Linux reference driver

New IL Criteria

UNH-IOL
NVMe Test Consortium

NVMe Integrators List Policy
Version 1.1b
Policy Document

Last Updated : July 14, 2014

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- Review the NVMe Integrators List 1.1b Policy Document for detailed listing criteria:

https://www.iol.unh.edu/services/testing/NVMe/integratorslist.php

New Tests

Plugfest is also launch point for new tests:

Already Documented:

- Conformance Test 2.7 - Write Zeroes
- Conformance Test 6.4 - Sub System Reset
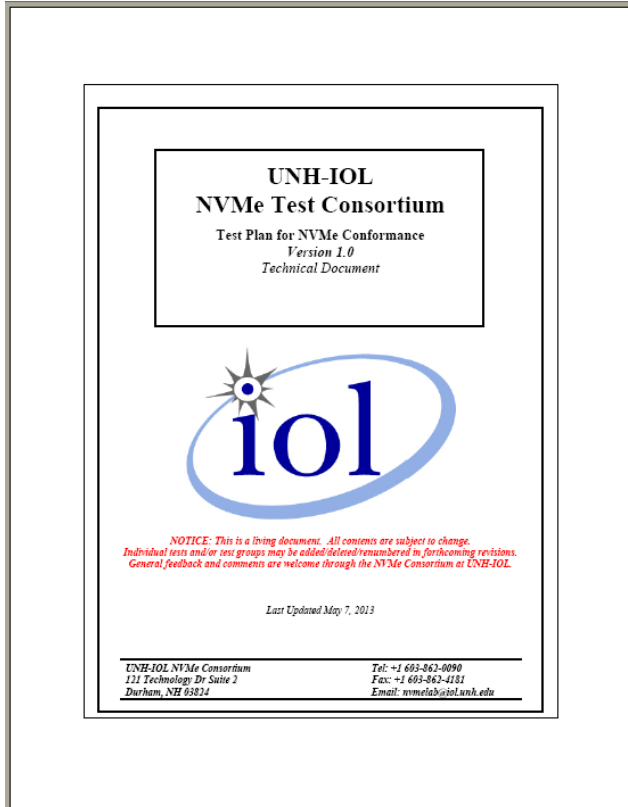- Interop Test 1.7 – Dual Ports

In Development:

- Conformance Test Group 7 - Reservations

New Tests

Review the UNH-IOL NVMe Conformance and Interop 1.1b Test Suite documents to see the procedures in detail:

https://www.iol.unh.edu/services/testing/NVMe/testsuites/

Review

- NVMe Test Program focused on Integrators List to showcase interoperable and conformant products.
- Test tools and plans available from UNH-IOL.
- Plugfest will allow the first opportunity to list products on the NVMe Integrators list v1.1b.
- Plugfest will walk SSDs through multiple conformance and interop stations.
- Testing can continue After the Plugfest for those unable to attend.

Further Questions? Visit us at Booth #920

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