

Ten Years of Testing NVMe Solutions, and What is Coming Next

Presenter: Carter Snay, University of New Hampshire InterOperability Lab

Speaker



- Technical Manager,
Data Center Technologies
- Testing & Customer Relations
- 5 years of experience working in NVMe® technology



About the UNH InterOperability Lab (UNH-IOL)

- A neutral and independent lab that tests networking and data communications products for businesses across the globe.
- Started in 1988 on the University of New Hampshire Durham, NH campus.
- Non-profit organization and 100% funded by commercial industry with over 150+ member companies.
- State of the art facility with 28,000+ sq. ft. (1 hour outside Boston, USA).
- 4,200 sq. feet of pre-wired space dedicated to Plugfests.



The UNH-IOL and NVM Express Organization: History and Current Times

Connection with the
NVM Express
Organization:

Since 2012, NVM Express has
collaborated with UNH-IOL to
manage the Integrator's List
based Test Program on behalf
of NVM Express Organization



Develop Test Plans and
Automated Test Software to
Complete NVMe Compliance
Testing



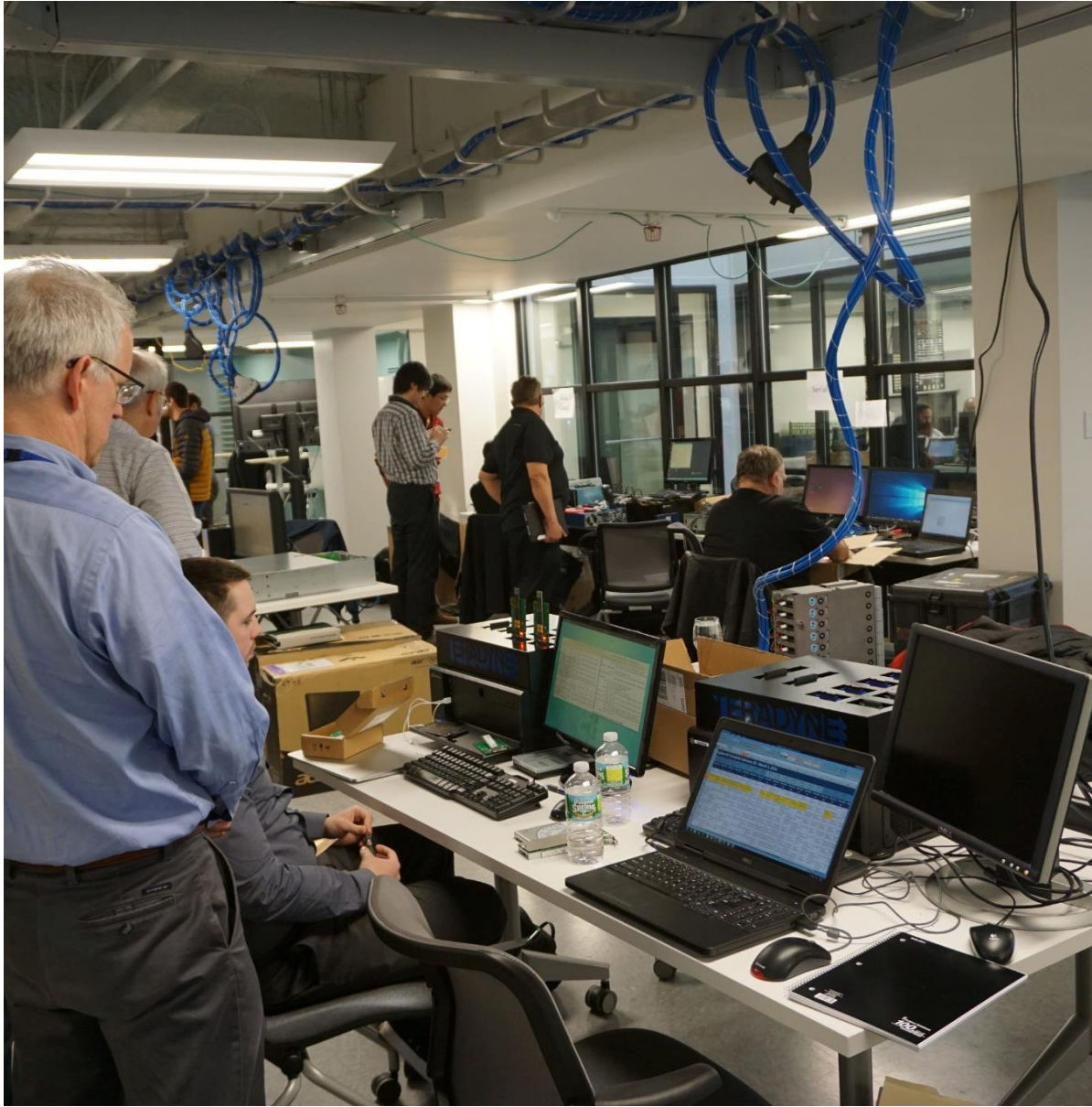
Continue to release software
based on latest Technical
Proposals, and perform
independent compliance
testing at the UNH-IOL
Facility



10 Years of NVMe® Plugfests







Origin of NVMe® Specification and Importance of Testing

- Started with PCIe® as only transport
- Admin and NVM I/O Command Sets
- Testing for the last decade
- Conformance and Interoperability Testing
 - Why?
 - Making sure the product “just works!”



Test Plans Based on the Specifications

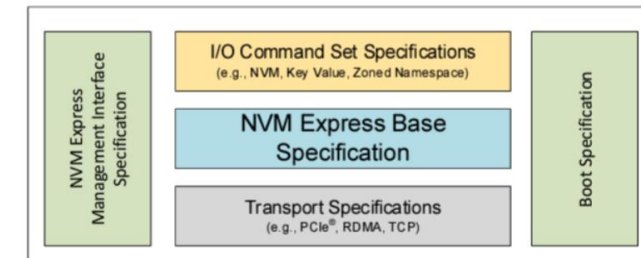
- Test published by the UNH-IOL, written in conjunction with the NVMe® Interop and Compliance Work Group
- Originally, 2-3 test plans were required for listing on Integrator's List
 - UNH-IOL NVMe Conformance
 - UNH-IOL NVMe Interoperability
 - UNH-IOL NVMe-MI Conformance (if supported)

Specifications

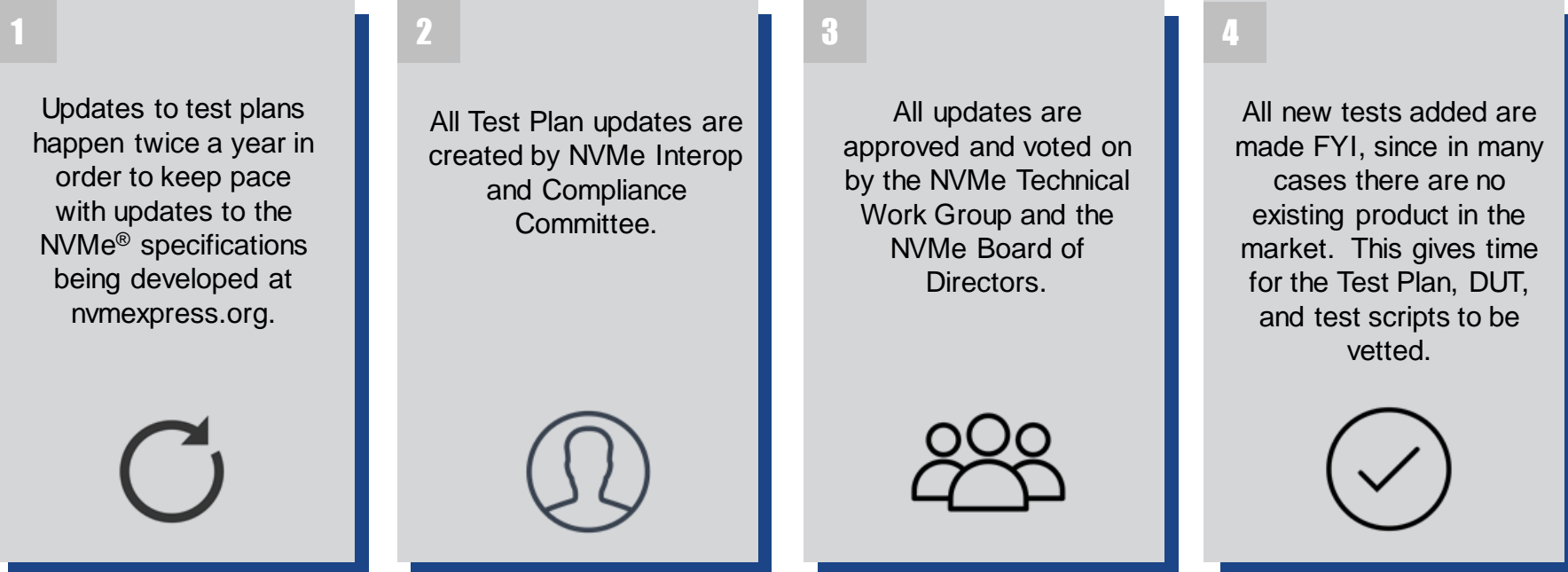
NVMe Specifications Overview

The NVMe Express® (NVMe®) family of specifications define how host software communicates with non-volatile memory across multiple transport protocols including SATA, PCIe, RDMA, TCP and more. It is the industry standard for solid state drives (SSDs) in all form factors (U.2, M.2, AIC, EDSFF). NVMe Express is the new industry standard for high performance storage. Industry leaders defining, managing and marketing NVMe technology. The latest versions of the family of specifications, NVMe 2.0 family of specifications, were released on June 3, 2021.

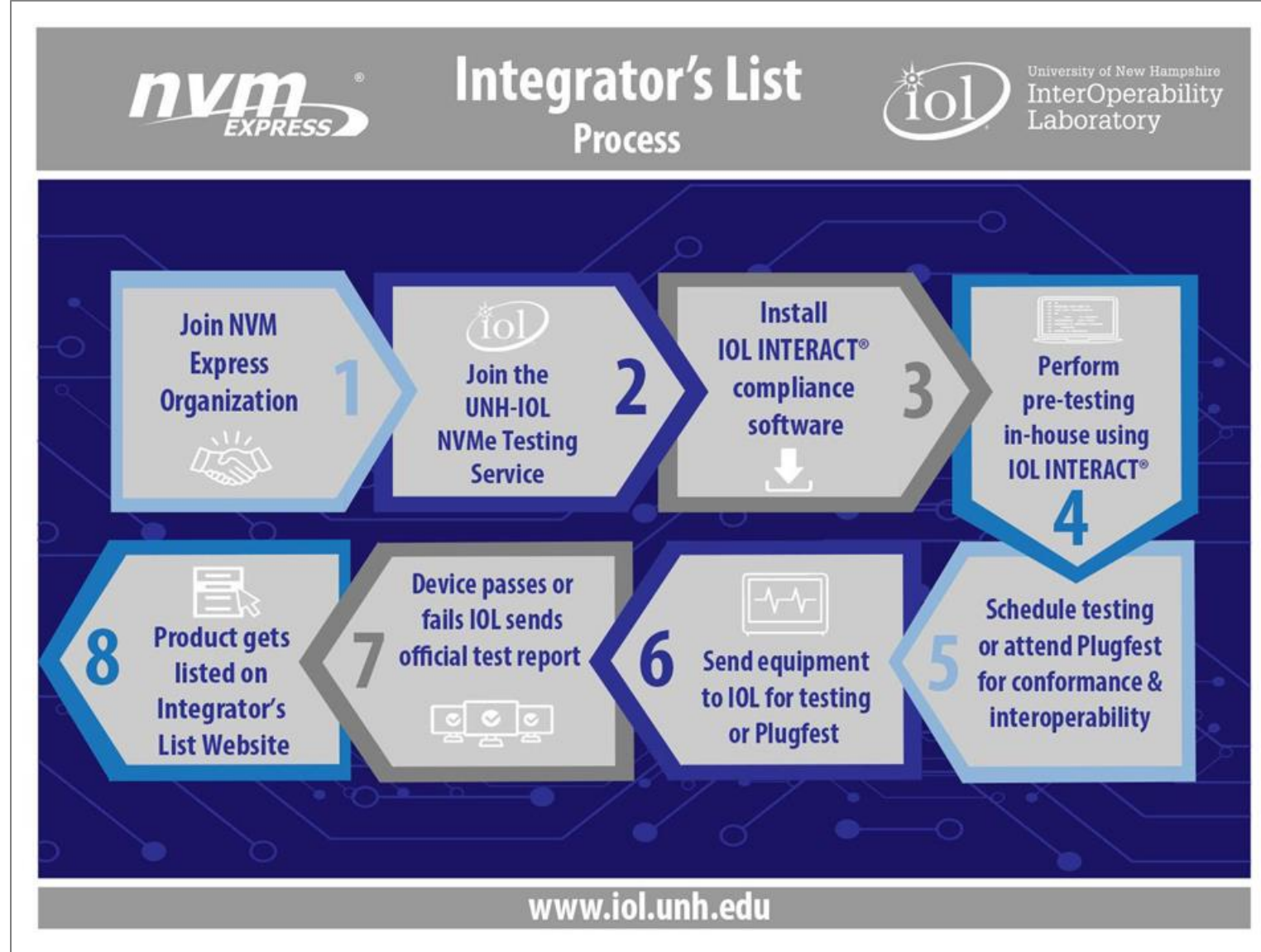
Guide to the NVMe Express Specification Family

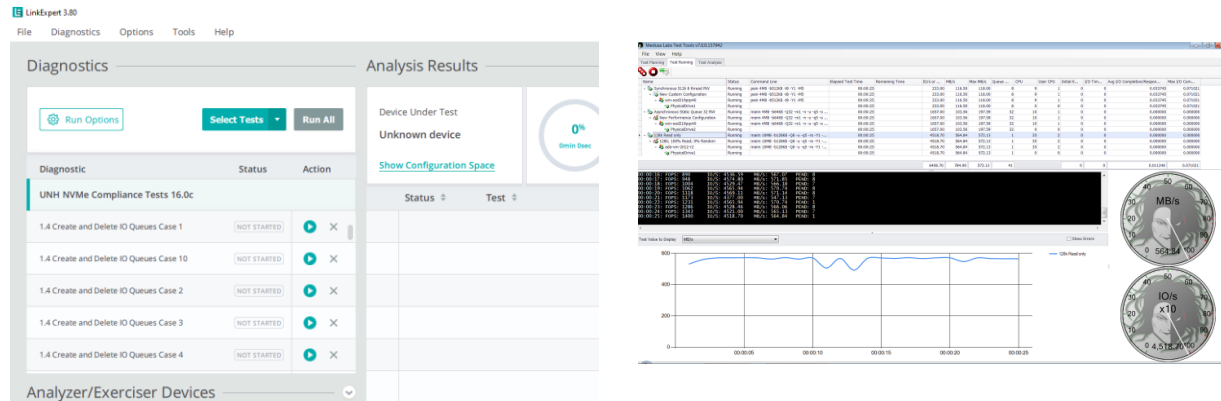


Test Plan Development Process



The Certification Process





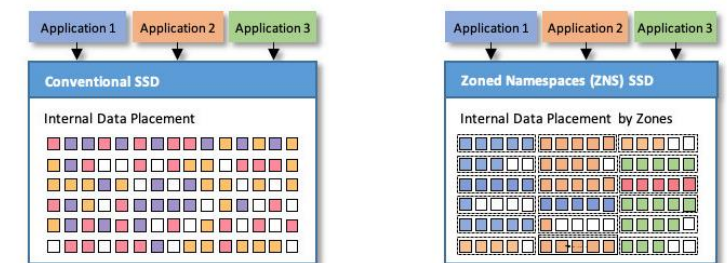
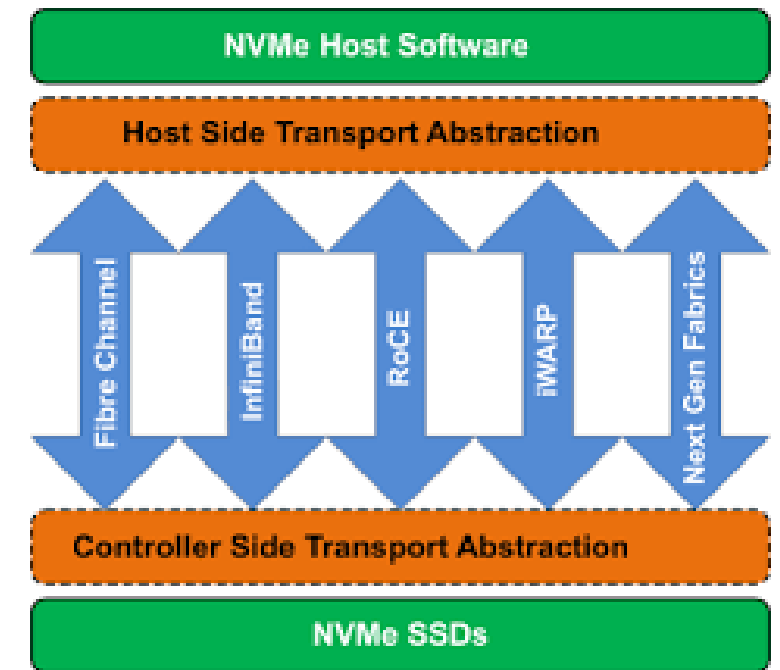
The Test Tools

Conformance testing done with IOL INTERACT PC Edition and LeCroy Edition for automated testing



Vdbench and Medusa Labs Test Tools for interoperability testing

What we are Focusing on Testing in the Future for New Test Items



TP2016

- TP 4146 Flexible Data Placement
- TP 4097a Abort Enhancements
- TP 4136 Should to Shall Conversion Catch-up
- TP 4145 Namespace Admin Label
- TP 4115 ZNS namespace and capacity report enhancements



TP2016 Phase 2
ICC Plugfest Fall 2023

Tim Sheehan – UNH-IOL

May 25, 2023



TP 4146 Flexible Data Placement

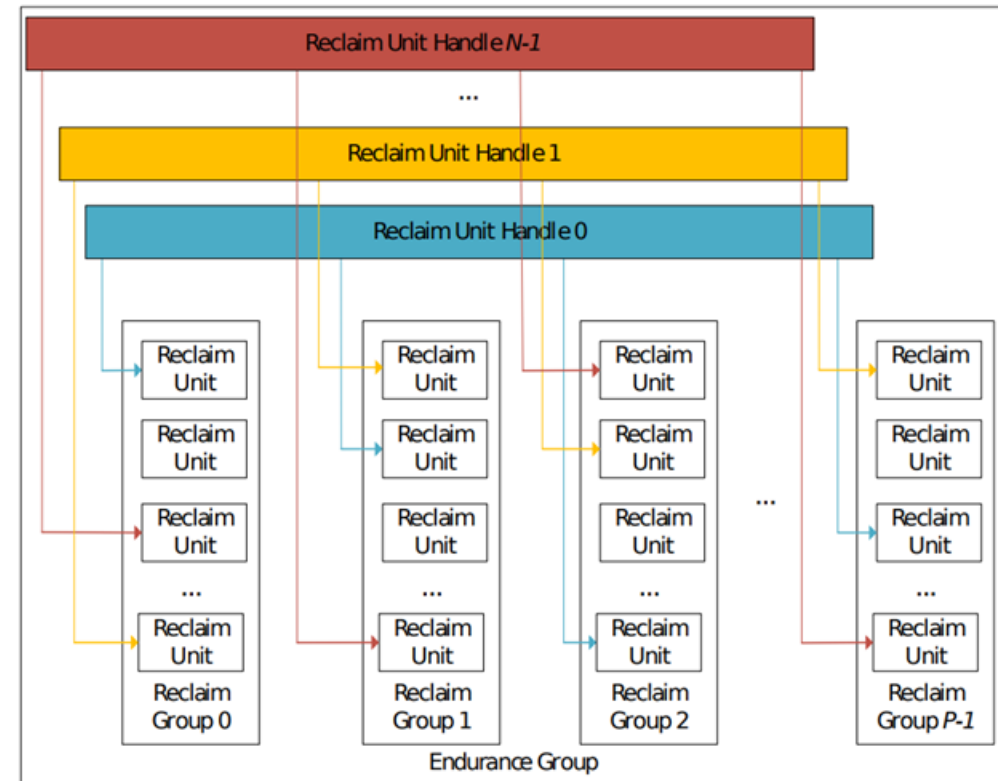
60 New FYI Tests

I/O Management Send/Receive

Get and Set Features for FID 1Dh

NS management in Endurance Groups, configuration of FDP using set features

FDP Related Log Page Tests (20h-23h)



Other Items for Beyond TP2017

TCG Storage Key Per IO TP4055

NVMe/TCP – TLS updates TP8018

Cross-Namespace Copy TP4130



How to Test and Be Ready for Certification

Getting the software prior to sending device in for certification testing



The University of New Hampshire uses OneDrive for all filesharing



Attend NVMe ICC Meetings to discuss what items are most important for testing

- Technical Proposals are selected based on what seems highest priority by the NVMe TWG, all feedback and suggestions are welcome

ICC Calls

Interop and Compliance Committee (ICC)

Chair: Ryan Holmqvist, Intel

Meets every other Tuesday 2PM Eastern / 11AM Pacific

Announcements/Meeting invites made on ICC reflector and on nvmexpress.org



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Q & A

