



OPEN
Compute Project



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Universal Connectivity and Interoperability in the Open Ecosystem

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University of New Hampshire
**InterOperability
Laboratory**

OPEN HARDWARE.

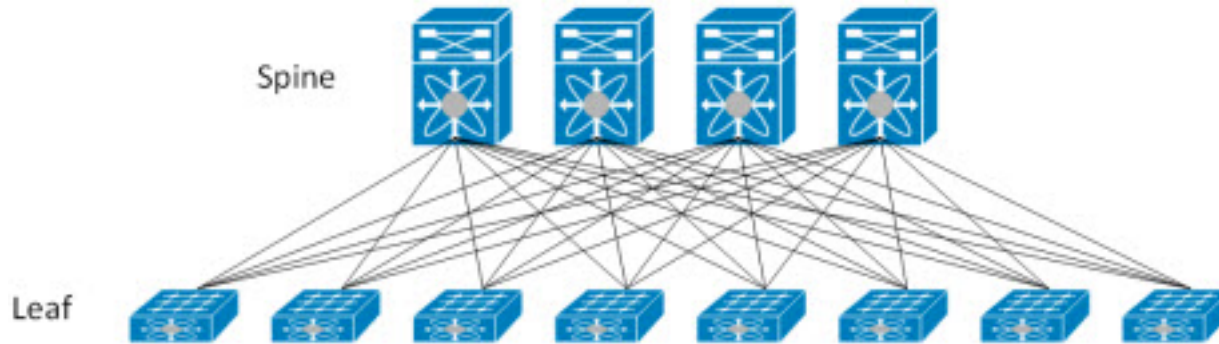
OPEN SOFTWARE.

OPEN FUTURE.

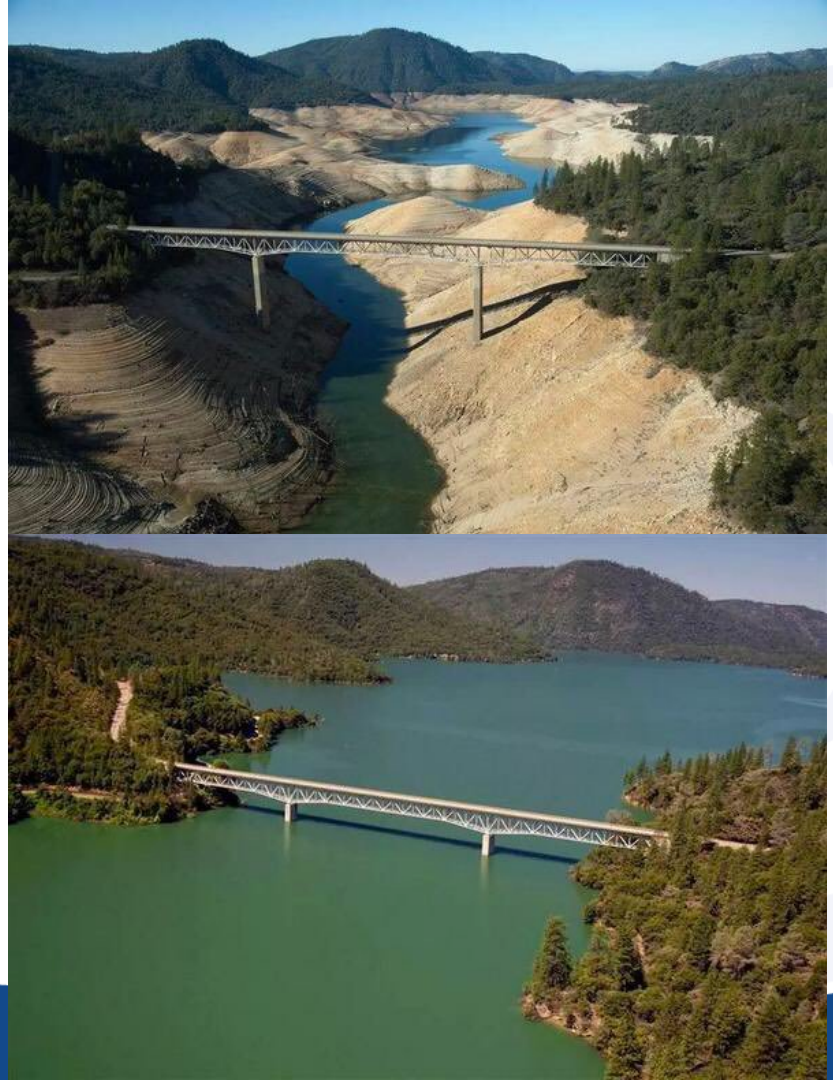


Interoperability

Whitebox = New, simplified, DC Designs



Whitebox
=
New Customers





Whitebox
=
New Interop
Problems?



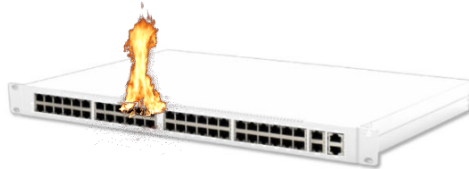
© Sacbee

By default:

Open \neq Interoperable

Open ≠ Interoperable: Examples

Example 1: Found @ UNH-IOL February 2015:
Release version of NOS 'A' + Whitebox Switch
'B' and Optic 'C', 10G port would not activate. Culprit:
improper phy tuning for board layout.



This interop issue led to startup of OOM (Open Optical Monitoring) subgroup within OCP Networking Project

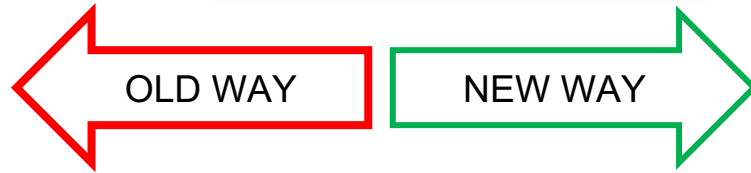
Open ≠ Interoperable: Examples

Example 2: Found @ UNH-IOL August 2016: Version of NOS 'X' + Whitebox Switch 'Y' did not support DACs at 100G.



Open ≠ Interoperable: Examples

Example 3: Found @ UNH-IOL August 2016: Version of NOS 'E' + Whitebox Switch 'F', Only recognized one brand 'G' of 100G optics



A top hyperscale company found this same issue on this same combination later that same week.
Ouch!

Open ≠ Interoperable: Examples

Example 4: Found @ UNH-IOL August 2016. NOS 'X' and 'Y' did not support 100G DACs that identified in EEPROM as 'QSFP+ or Later', but did support 'QSFP28 or Later' ones.



Open ≠ Interoperable: Examples

Example 4: “QSFP+ or later” vs “QSFP28 or Later”

- A properly built QSFP28 cable could be backward compatible to QSFP+ applications. This is desirable, supports universal connectivity.
- Identifying as ‘0Dh - QSFP+ or later’, is allowed (and even recommended) by SFF-8024, rather than simply ‘11h - QSFP28 or later’, because it supports backwards compatibility.
- Some NOS rejecting these cables when plugged into 100G ports, because they identified as 0Dh instead of 11h.
- 802.3-by spec identifies using QSFP28-QSFP28 DAC in a 4 lane 25G config, with different codes to identify FEC support and expected length.

Interop problems = unhappy customers

Unhappy Customers = Low Adoption

Open ≠ Interoperable, why?



1. Access to Products



2. New Types of Interop Variables



3. Exponentially Larger Interop Matrix



4. Integration Resources Gap



1. Access to Products

Problem: Access to Products (try to buy some)

Solution: Get a few samples together in one place (sandbox) and make it available to everyone



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2. New Types of Interop Variables

Problem: Variables are now both intra-device **and** inter-device

Solution:

- test box-to-box and within box
- look at interaction of Apps, NOS, HW



2. New Types of Interop Variables

Solution:

- Prove Layer 1 Interop
- Check Optics Module/Cable interop and connectivity
- Open Networking Integrators List



Open Networking Integrators List

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This Integrator's List (IL) community effort listing Open Networking configurations demonstrated to be interoperable according to a community created test plan. In this list you will find information about Open Networking 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 Open Networking environments.

Information on the test procedures used can be found on our [Test Suites](#) page

Products listed here have met the requirements of the [Open Networking Integrator's List Policy](#).

| NOS | Host/Switch | Module/Cable | Test Plan Revision | Date Listed | Further Info |
|---------------------|-------------------|---------------------------------|--------------------|-------------|--------------|
| Cumulus Linux 2.5.5 | Accton AS6712 | 3M QSFP+ DAC 9QAD-111-12-3-00 | 26 | 02/24/16 | |
| Cumulus Linux 2.5.5 | Accton AS5712-54X | 3M SFP+ DAC 1410-P17-00-3-00 | 26 | 02/24/16 | |
| Cumulus Linux 2.5.5 | Accton AS6712 | Avago QSFP+ AOC AFBR-7QER05Z | 26 | 02/23/16 | |
| Cumulus Linux 2.5.5 | Accton AS5712-54X | Avago AFBR-709SMZ Module | 26 | 02/23/16 | |
| Cumulus Linux 2.5.4 | Accton AS5712-54X | Avago AFBR-709SMZ Module | 26 | 02/23/16 | |
| Cumulus Linux 2.5.4 | Accton AS5712-54X | 3M SFP+ DAC 1410-P17-00-3-00 | 21 | 01/08/16 | |
| Cumulus Linux 2.5.3 | Accton AS5712-54X | Amphenol SFP+ DAC 571540002 | 20 | 10/09/15 | |
| Cumulus Linux | Accton AS5712-54X | Finisar QSFP+ Module FTL410QE3C | 20 | 10/09/15 | |

<https://www.iol.unh.edu/registry/opennetworking>



2. New Types of Interop Variables

Solution:

- Solid Foundation on testing Layer 1, move to Layer 2
- UNH-IOL is working with Agema to identify critical reference use cases for Layer 2 and beyond
 - Datacenter
 - Enterprise
 - Service provider (CORD)





2. New Types of Interop Variables

Solution:

- Launching ONIE Tested Program now.
- Demonstrate compliance to ONIE Contract
- Independently Verified
- ONIEtested.org





3. Exponentially Larger Interop Matrix

Problem: In a truly open eco system, the interop matrix is massive:

Module * switch * NOS * Server * Server BIOS * NIC *
Server OS * NIC Driver * NIC FW

Two of each is $2^9 = 512$ combos!



3. Exponentially Larger Interop Matrix

Solution: Do the testing, but cast a wide net





4. Integration Resources Gap

Problem:

- 📞 If it doesn't 'just work' Who do you call? 🙋
- ⚒ Significant effort needed to validate each component in an Open HW solution.
- 🆘 Many Enterprises don't have equipment or resources for this



4. Integration Resources Gap



Solution: Now Launching Open Solutions Validation Service (OSVS)

- Engage directly with enterprise datacenter users
- Leverage existing expertise in component validation
- Already working with Hyperscalers as well as Financials.



4. Integration Resources Gap

Solution: Integrators Lists

- Provide buyers confidence that configs have been independently tested
- Now over 100 tested configs on the Open Networking Integrators List

2015

- **October 2015 Fidelity OCP EW Boston, MA**
- Launch Open Networking Integrators List 10/40G Ethernet



2016

- **August 2016 UNH-IOL OCP EW Durham, NH**
- Add LR, LR-Lite Optics to Open Networking Integrators List
- Add 100G to Open Networking Integrators List at NH OCP EW

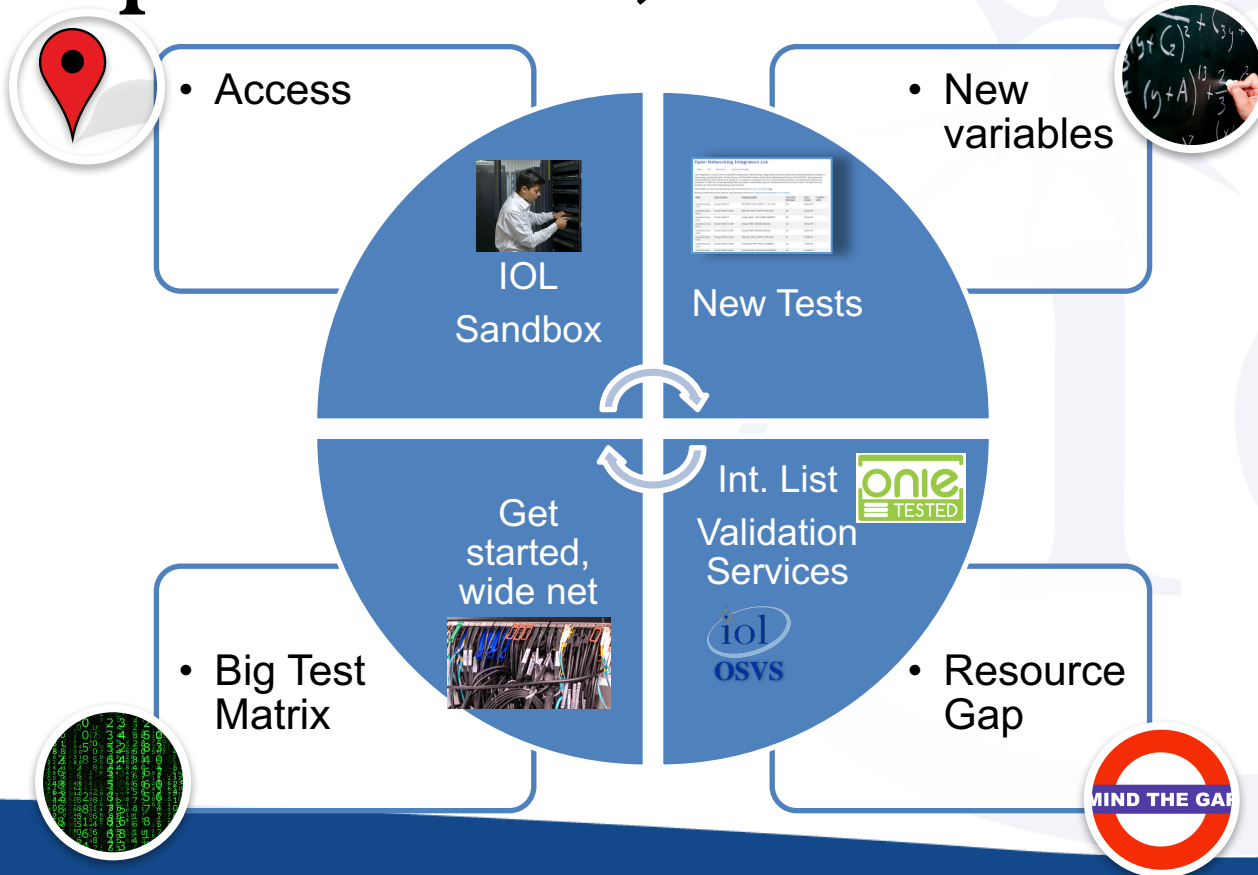


2017

- **March 2017 OCP US Summit Santa Clara, CA**
- Launch ONIETested.org
- 100+ Configs on Open Networking Integrators List ¹⁰⁰
- Launch UNH-IOL OSVS



4 problems, 4 solutions





Whitebox:
it just works

Open = Interoperable

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Q&A



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