



University of New Hampshire  
InterOperability  
Laboratory

# **Accelerate 1588/PTP and TSN Testing: A UNH-IOL Webinar on vIOLet<sup>®</sup> Software**

Presented by Bob Noseworthy and Daroc Alden

[www.iol.unh.edu](http://www.iol.unh.edu)

Please type any questions you have into the “*questions*” window at anytime – we will address these at the end.



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# Agenda

- Who is the UNH-IOL
- What is vIOLet<sup>®</sup> & How it Works
- Key Features
- Demo
- Road Map & Test Tool Access
- Q&A

# The UNH InterOperability Laboratory



The InterOperability Laboratory (UNH-IOL) was founded in 1988. Main UNH campus is located in Durham, New Hampshire, USA

The UNH-IOL is a non-profit neutral, third-party laboratory dedicated to testing data networking technologies through industry collaboration.

A brief history of UNH-IOL and AVB/1588/TSN:

- 1988 - Testing Ethernet for over 30 years,
- 2005 - Residential Ethernet leads to AVB,
- 2010 - ISPCS host (1588 Conference/Plugfest),
- 2012 - NIST 1588 Support for initial test plans
- 2012 - Avnu Alliance & UNH-IOL start AVB development
  - Developed conformance tool is "Violett"


# The UNH-IOL 1588/Avnu/TSN Lab

- IEEE 1588 Power Profile Certification
  - Supported by NIST, IEEE-SA's ICAP program, Utilities and Manufacturers
  - IEEE/IEC 61850-9-3 & IEEE C37.238
- Additional IEEE 1588 services:
  - Default profile, Silicon validation for TCs, *ITU-T G.8275.1, G.8275.2, G.8262.1 (in dev)*
- Avnu Alliance Recognized Test Facility
- OPEN Alliance Test House + Contributor
- IEEE/IEC 60802 CA (Industrial TSN Profile)
  - Currently supporting Ethernet-APL testing



# What is vIOlett<sup>®</sup>?

vIOlett is a test framework for automating conformance testing for:

- Avnu Bridges, Milan and ProAV Endstations
- TSN Automotive Equipment
- Precision Timing including:
  - IEEE 1588 Power Profile (IEEE Certification program for 61850-9-3 & C37.238)
  - In Development:
    - ITU Telecom Profile, IEEE 1588-2019 Updates / 802.1AS-2020 Updates
    - NTP NTS C&I thanks to a generous gift from the  Internet Society

Plans to support additional 1588/TSN needs are underway, as well as additional Automotive and Industrial Testing (OPEN Alliance, 60802, etc)

# vIOLet Features

- More than 1,500 Conformance and Interop test-cases
- Automated testing for most tests
  - Automated analysis to assist manual testing for remaining tests
- Captures and signed test logs for every test
- Controllable via a REST API
- Widgets to test scenarios not covered by the formal test plan

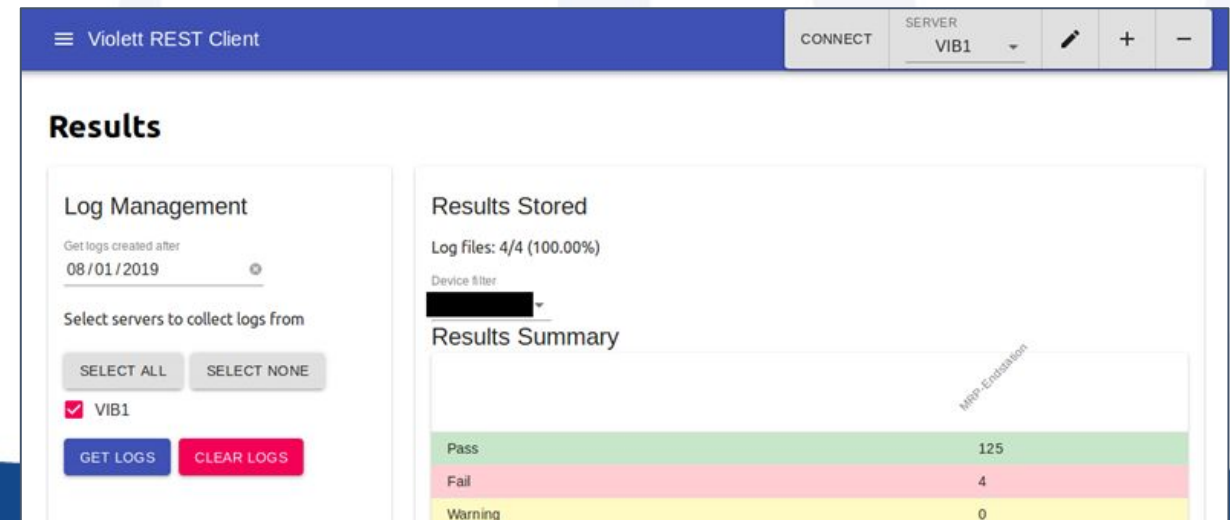
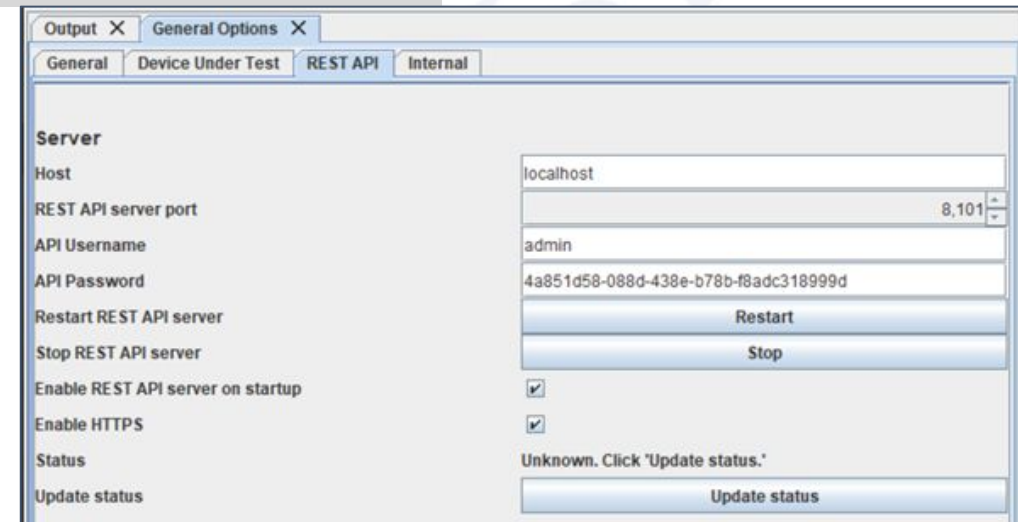
UNH-IOL uses vIOLet in-house to perform conformance testing

# vIOlett Feature: RESTful Interface

## REST Server enabling automation of the framework:

- Run tests, get results, modify configuration

## Example Open Source RESTful Client available



# vIOlett Feature: Widgets

User-controlled Widgets aid in debugging: Wireshark Sniffers, PTP & 1722.1 Emulation, etc.

The image displays two user-controlled widgets from the vIOlett interface. The top widget, titled "Resource 1", shows network delay metrics: Total Network Delay (8853104 nanoseconds), DUT Pdelay Turnaround Time (8852809 nanoseconds), 1-way Path Delay (295 nanoseconds), Average Path Delay (117.089 nanoseconds), and Standard Deviation of the Path Delay (301.611 nanoseconds). It includes "Start" and "Stop" buttons. The bottom-left widget is the "PTP Master Port Emulator" for "i210-1". It displays the status "i210-1 is currently the grandmaster.", Current Grandmaster ID (aabbccfffe04706c), Current Grandmaster Priority1 (100), Transmitted Priority1 (100), Transmitted Port Number (0), PTP Profile (Gptp), and IPv4 Address. It features "Start", "Stop", and "Enable BMCA" (checked) buttons. The bottom-right widget is the "AVDECC Controller Widget" for "Device Name - MAC: 00:00:00:00:00:00 - ID: 0000000000000000". It shows "Test Station" (Echo1), "Controller ID" (0011223344556677), and buttons for "Discover Entities" and "Clear Log". It also has tabs for "AEM READ DESCRIPTOR", "AEM COMMANDS", and "ACMP", with fields for "Descriptor Index" and "Configuration Index" (both set to 0), and an "ENTITY" dropdown with a "Read" button.

# vIOlett Feature: Batch mode

Violett has command-line “batch mode” support with an xml file

- Using the violett launcher (linux):
  - violett -- -b batch.xml
- Simpler than RESTful control for some users.

```
<?xml version="1.0" encoding="UTF-8"?>
<batch>
  <!-- load a mode and run test(s) from it -->
  <changemode modeName="1722 (AVTP MAAP)" />
  <runtest testName="AVTP.c.1.1a" />

  <!-- "echo" command -->
  <echo message="Now running all endstation tests" />

  <!-- run all endstation test modes -->
  <runmode modeName="1722 (AVTP MAAP)" />
  <runmode modeName="BA-Endstation" />
  <runmode modeName="Co-Existence" />
  <runmode modeName="FQTSSEndstation" />
  <runmode modeName="Interop" />
  <runmode modeName="MediaClock" />
  <runmode modeName="MRP-Endstation" />
  <runmode modeName="gPTP" />
</batch>
```

# vIOlett Feature: Ixia Automation

vIOlett has ability to run Credit Based Shaper (FQTSS) tests using Ixia TSN capable blades

- Requires IXIA hardware, IxNetwork and appropriate UNH-IOL license



# Pre-configured Systems

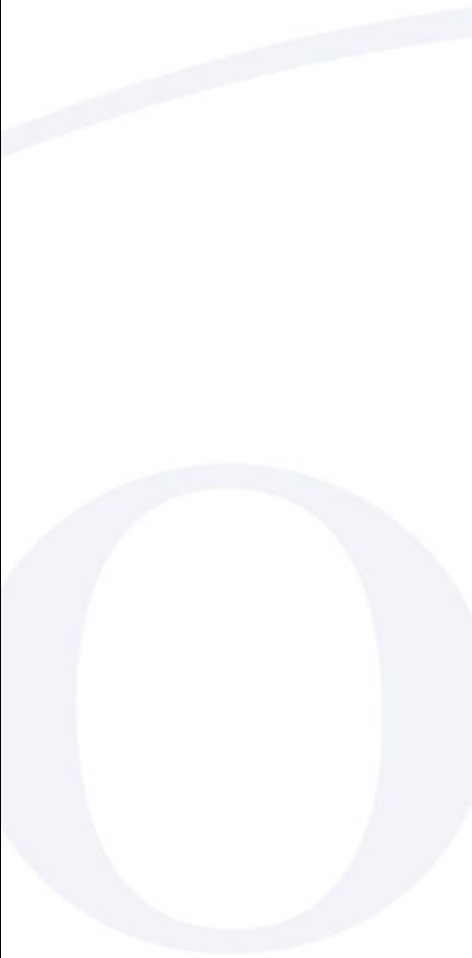
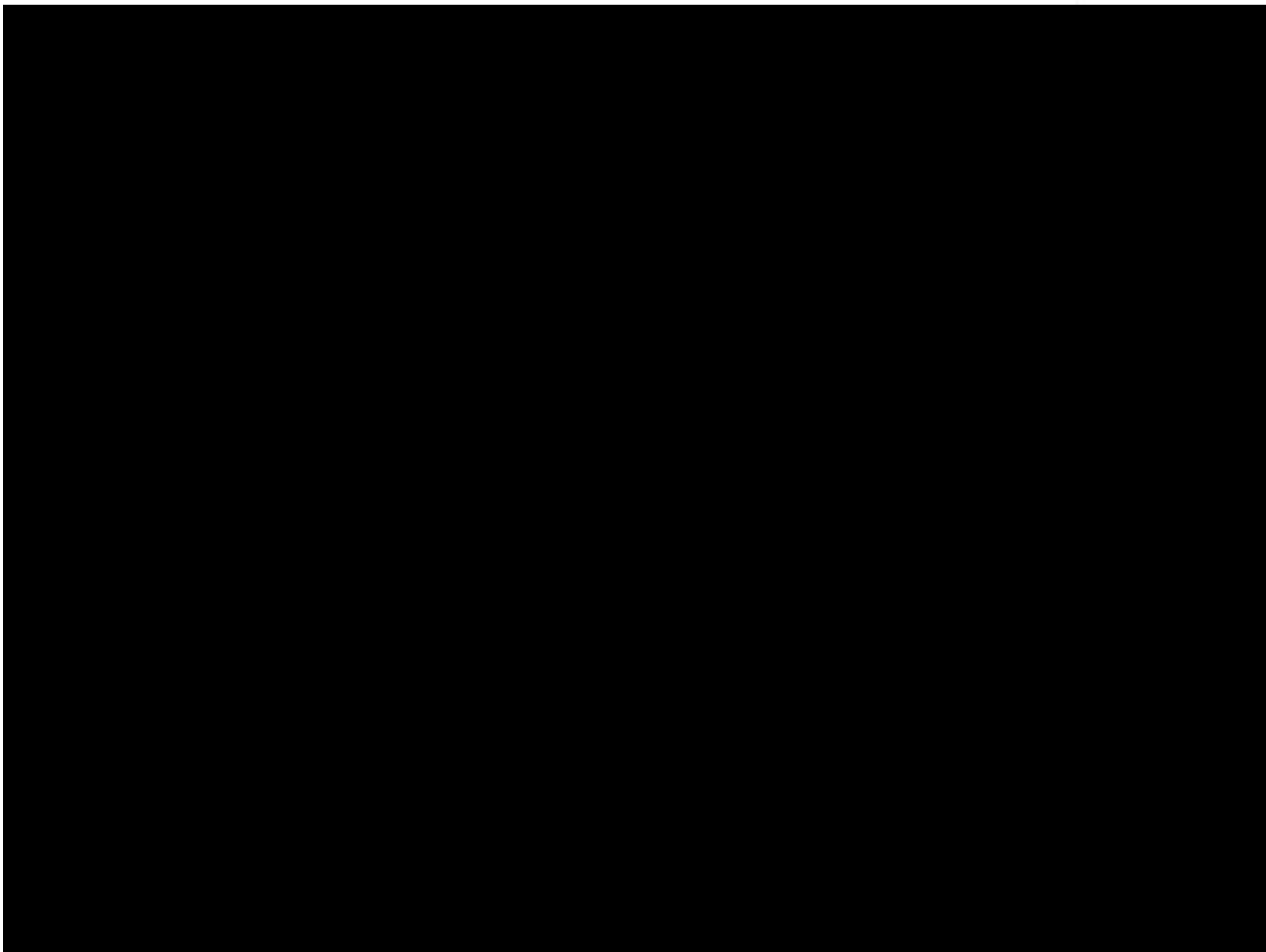
Available on request at modest fee

- Pre-configured hardware and pre-installed tools



# Demo

Presented by Daroc Alden



# Road Map & Test Tool Access

# Violett Licensing & Access

- 1588 Offerings -- [iol.unh.edu/solutions/test-tools/ptp](http://iol.unh.edu/solutions/test-tools/ptp)
- Avnu Offerings -- [iol.unh.edu/solutions/test-tools/avnu](http://iol.unh.edu/solutions/test-tools/avnu)

## Several test packages are offered:

- Avnu Violett® Milan(\*)/Base Endstation Test Package
- Avnu Violett® ProAV(\*)/Base Endstation Test Package
- Avnu Violett® Bridge Test Package
- Avnu Violett® Bridge (w/ IXIA Automation) Test Package
- Avnu Violett® Automotive Endstation (AED-E/GM) Test Package
- Avnu Violett® Automotive Bridge (AED-B/GM) Test Package
- Avnu Violett® Automotive Bridge (AED-B w/ IXIA Automation) Test Package
- UNH-IOL Violett IEEE 802.1Q packages for MSTP, RSTP, VLANs, FDB, Jumbo Frames
- **New** Violett® IEEE 1588 Power Profile (61850-9-3 & C37.238) Certification Test Package
- **Coming Soon** Violett® IEEE 1588 ITU 8275.1 Telecom Test Package
- **Coming Soon** Violett® IEEE 1588 ITU 8275.2 Telecom Test Package

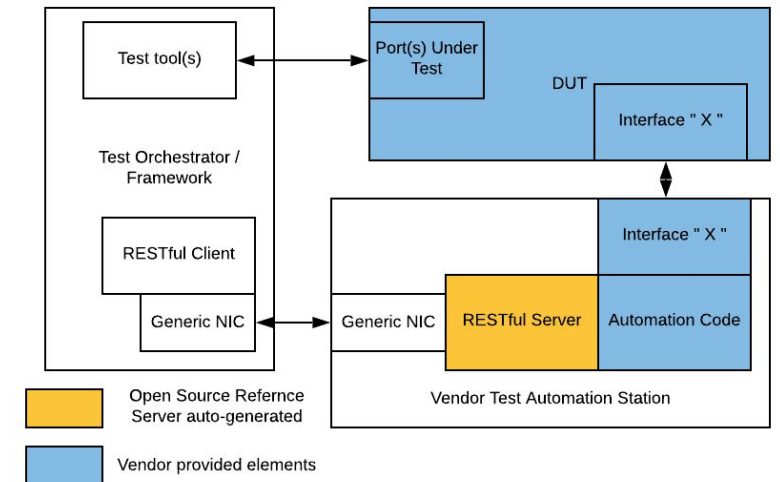
# In Development: TSN Test Tool



- TSN/AVB Capable FPGA-assisted NIC in development
- Leveraging decade+ of FPGA based tools for Ethernet Conformance
  - UNH-IOL BitPhyer tool available today (non-NIC traffic generator)
- TSN/AVB NIC planned capabilities
  - 802.1AS-2020 ready – Time Relay & gPTP in hardware.
    - master/slave, 1PPS in/out, & one-step support
  - 802.1Qbv, Qbu, .1CB
  - Slow protocols to/from host PC / Violett (MSRP/MVRP/etc)
  - Hardware driven Stream traffic generator
- Hardware and Test plans in development to support DoD interests.

# Additional Roadmap

- DUT Command & Control Interface
  - [oss.iol.unh.edu/dut-cnc/Auto\\_and\\_ProAV\\_Command\\_and\\_Control](https://oss.iol.unh.edu/dut-cnc/Auto_and_ProAV_Command_and_Control)
- End-user test creation / editing.
- UNH-IOL TSN Plugfest CY'21 (ITU 8262.1, Preemption, TAS, etc)
  - Calnex NEO, Ixia, Spirent, Xena, & UNH-IOL solutions available
- IEEE Power Profile Certification Launch (when IEEE ballot completed)
- IEEE Telecom Certification under consideration



# Membership at the IOL

Membership in our 1588, Avnu or TSN groups provides:

- Discounts on vIOLet licenses
- Increased support
- Reservation(s) in the UNH-IOL testing calendar
  - 3rd party test/debug/reporting and Certification

Please type any questions you have into the  
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## Contact Info & Tool Access

- Contact: [ptplab@iol.unh.edu](mailto:ptplab@iol.unh.edu) for 1588 or [avblab@iol.unh.edu](mailto:avblab@iol.unh.edu) for Avnu/Automotive or [tsnlab@iol.unh.edu](mailto:tsnlab@iol.unh.edu) for TSN Development or [apl-lab@iol.unh.edu](mailto:apl-lab@iol.unh.edu) for Industrial Advanced Physical Layer
- We have several levels of Test Packages based off your needs
- All information can be found on our website:

**[www.iol.unh.edu](http://www.iol.unh.edu)**

**Products & Solutions**

