Novus Mini
Compact Network Tester

L2-3 multi-rate ethernet testing — anywhere, anytime

Introduction

Keysight's Novus mini is the industry's most compact and portable network tester, offering complete Layer 2-3 conformance and performance testing in an affordable form-factor.

A platform capable of time sensitive networking (TSN), Novus mini provides a powerful time synchronization capabilities that includes the ability to synchronize with an external clock reference (requires 4-port option for mini / 6-port option for mini Pro).

Novus mini supports high-performance routing / bridging protocol emulation, line-rate L2-3 traffic generation with flow level traffic statistics and analysis, and both control and data packet capture.

KEYSIGHT

Highlights

- Meet test requirements with portable and full-featured 4-speed (10M/100M/1GE/2.5GE) fixed chassis.
- Optimize lab space and power use with the compact form factor.
- Enable broad test functions across L2-3 with a unified architecture that supports Keysight's IxNetwork application.
- Validate enterprise and service provider environments with an appliance that is purpose-built to test high-performance, low-latency devices.
- Validate automotive and industrial IoT (IIoT) networks.
- Test with a platform that is TSN-aware with precise time synchronization measurement capabilities.

Featuring IxNetwork Web Edition

IxNetwork's web application offers a new simple, lightweight way to connect easily from anywhere to run tests. Now you can avoid heavy client application installation, keep tests running in the background, and share and collaborate with peers across the globe with inherent session sharing. Migrate to a platform independent environment with IxNetwork Web Edition.

Web Edition includes a feature-rich GUI to configure IxNetwork tests, and REST API browser. The ability to switch between GUI and REST API browsers empowers easy automation.

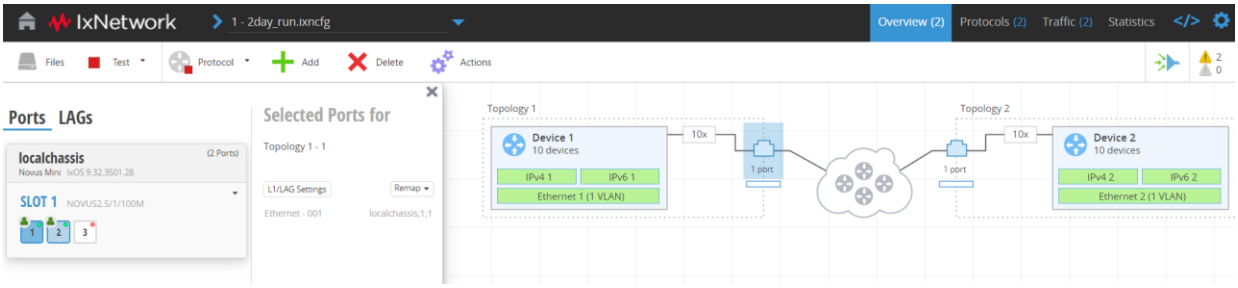


Figure 1. IxNetwork web edition

IxNetwork web application supports traffic generation and measurements that can ensure highest precision and performance. The sophisticated traffic generator is also integrated with the control plane protocols.

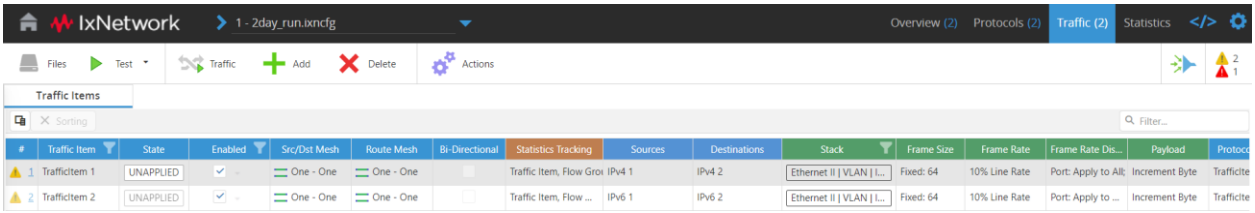


Figure 2. IxNetwork traffic view

IxNetwork web houses a powerful statistics viewer for viewing and analyzing real time results along with comprehensive report generation.

Figure 3. IxNetwork statistics viewer

IxNetwork web's built-in capture tool allows capturing of both control plane and data plane traffic. The integrated analyzer module is a sophisticated network analyzer that allows triggering and filtering of control and data plane packet captures based on user-defined packet fields. Captured packets can be saved and later accessed using Novus mini's integrated wireshark module.

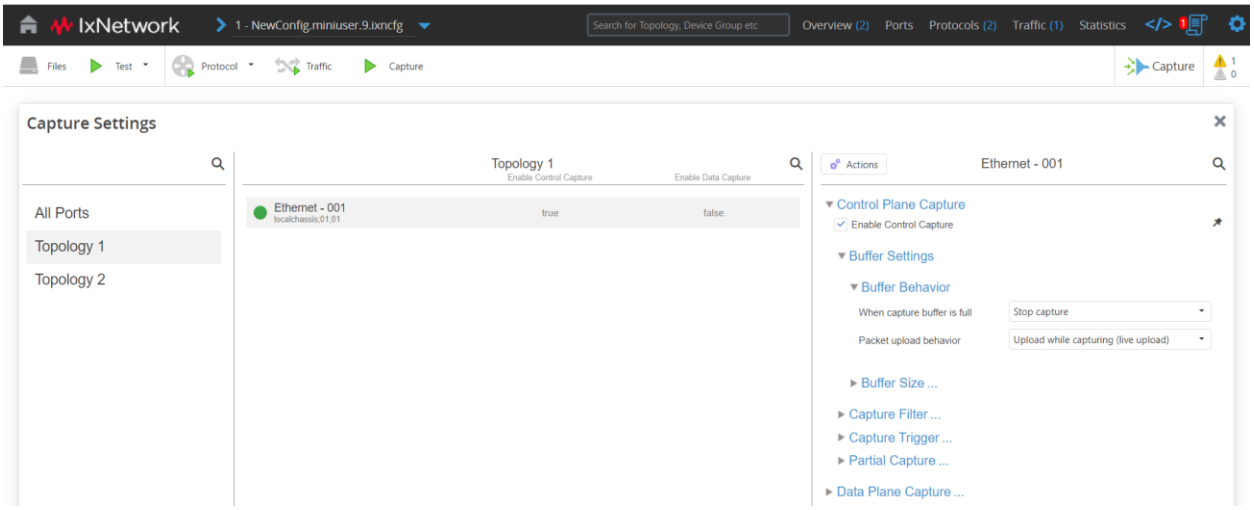


Figure 4. IxNetwork analyzer setting

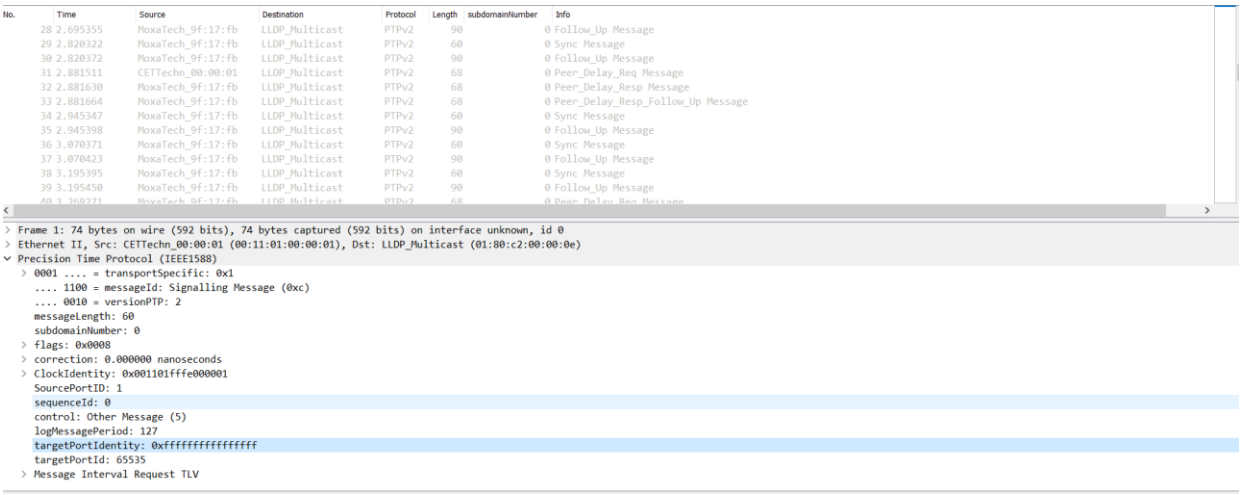


Figure 5. IxNetwork capture decode

Benchmarking Devices Using Quick Test

Quick Test allows users to run RFC benchmarking tests suites like RFC2544 and RFC2889 with a simplified user interface. It enables complex test executions with just two or three clicks and helps assess performance of a variety of network infrastructure devices.

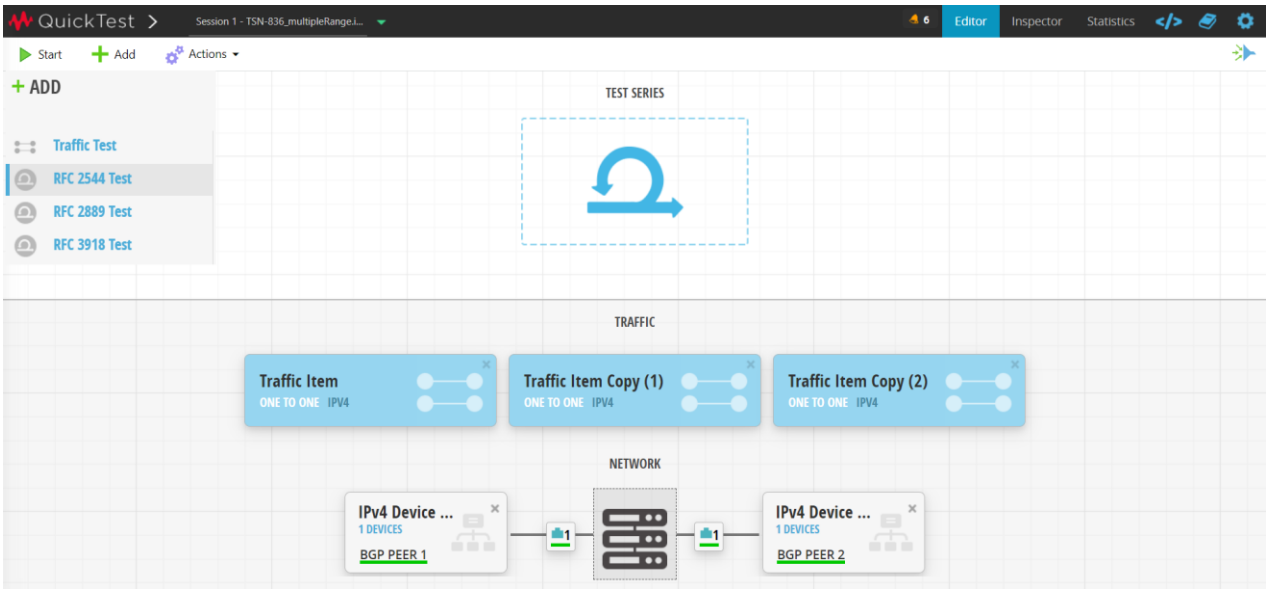


Figure 6. IxNetwork editor

Ensuring Interoperability with Keysight Network Conformance (KNC)

Keysight Network conformance is a web-based tool powered by IxNetwork engine that provides a common platform for all conformance test solutions. With KNC, you can quickly and easily view all the available conformance tests, create playlists of selected test cases, configure, and execute tests, and generate reports. Because it is a web-based tool, KNC offers the flexibility of using a web browser with no OS dependencies. KNC provides a simple, easy to use UI, with live logs, consolidated reports and run history. It also supports the option to download execution logs and packet captures for collecting diagnostics and debugging. KNC supports manual mode with the tool pausing the execution at steps where DUT configurations are required. KNC offers REST API based automation support enabling users to seamlessly integrate the tool with their automation and CI/CD environments.

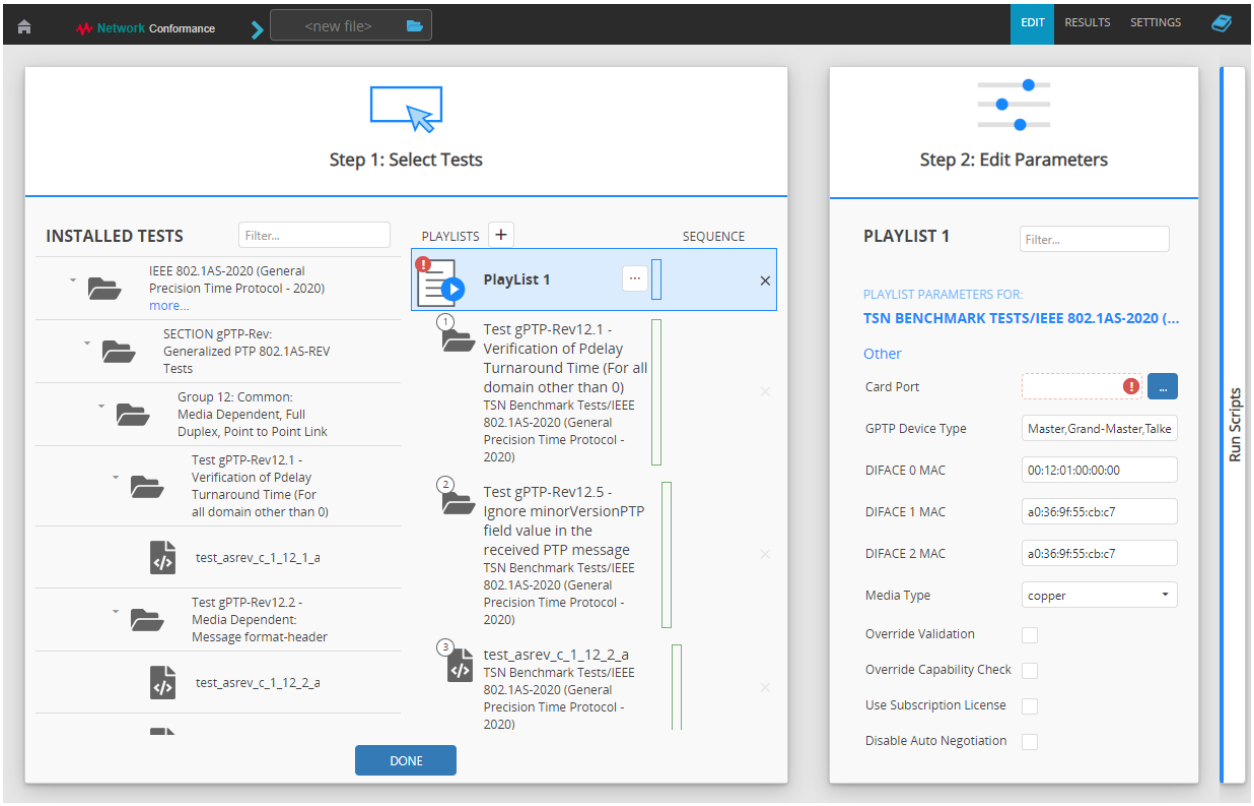


Figure 7. IxNetwork edit view

Portability, Power, and Performance

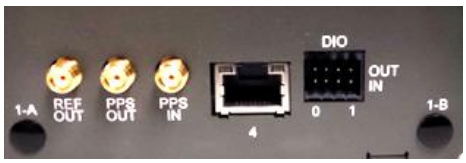
Equipped with powerful multi-core, multi-threaded network processors, Novus mini uses Keysight's next-generation architecture designed to meet highly precise testing needs. Because of its compact and highly affordable form-factor and reduced power requirements, the Novus mini is a great option for customers who need high-performance testing yet are constrained by space, power, and affordability A single Novus mini fixed chassis allows emulation of multiple time sensitive traffic endpoints. The system provides enhanced accuracy pertaining to latency measurements, with a resolution of up to 3.2 ns to deliver line-rate performance, including small 64-byte packets.

Key features

- Full line-rate traffic generation to evaluate ASIC designs, FPGAs, and hardware switch fabrics.
- Scale and performance for emulating L2/3 protocols by using Keysight's IxNetwork application.
- Support for extensive TSN capabilities includes 802.1AS-2011, 802.1AS-2020, 802.1Qav, 802.1Qbv, 802.1Qat, 802.1CB & 1722.
- Support for Avnu conformance test plans, includes Avnu Automotive, Avnu Industrial, and Avnu Component test packages.
- Support for Keysight defined TSN Conformance test package, includes conformance for 802.1AS-2011, 2020, 802.1Qbv, 802.1Qci and 802.1CB.
- Industry-standard RFC tests, including RFC2544, RFC2889, RFC3918 (requires four ports), and protocol emulation on 2.5G, 1G, 100M or 10M ports.
- 4-Speed 2.5G, 1G, 100M, and 10M line-rate packet capture and decode tools to detect and debug data transmission errors.
- Support for IxNetwork application and related automation APIs.
- Real-time latency with latency resolution of up to 3.2 ns.
- Extensive port and traffic flow statistics.

Novus mini

Novus mini Pro



Novus mini

Novus mini Pro

Specifications

Novus mini

Number of Ports	3-Port	4-Port Speed
Port Speeds	2.5GE/1GE/100M/10M	2.5GE/1GE/100M/10M
Part number	NTNM00100A option 003	NTNM00100A option 004
Hardware Specifications		
Physical Interfaces	RJ-45	
CPU and Memory	Multicore processor with 16 GB of CPU memory per appliance	
Cable Media	CAT5e CAT6 CAT6A	
Appliance Dimensions	2.2” (H) x 6.02” (W) x 4.25” (D) 56 mm (H) x 153 mm (W) x 108 mm (D)	
Appliance Weights	Appliance only: 2.11 lbs (0.96 kg)	
Temperature (Ambient Air)	Operating: 32 °F to 104 °F (0 °C to 40 °C) Storage: -13 °F to 185 °F (-25 °C to 85 °C)	
Power	Input: 100 – 240 VAC, 50-60 Hz, 1.4 A Output: 20 VDC, 6 A, Max power: 120 W	
Humidity (Ambient Air)	Operating: 10 % to 90 %, non-condensing Storage: 0 % to 85 %, non-condensing	
Transmit Feature Specifications		
Transmit Engine	Wire-speed packet generation with timestamps, sequence numbers, data integrity signature, and packet group signatures	
Max. Streams per Port	64	
Stream Controls	Rate and frame size change on the fly, sequential and advanced stream scheduler	
Minimum Frame Size	1GbE and 100MbE: 64 bytes at full line rate	
Maximum Frame Size	1500 bytes	
Maximum Jumbo Frame Size	9728 bytes	
Frame Length Controls	Fixed, increment by user-defined step, weighted pairs, uniform, repeatable random, IMIX, and Quad Gaussian	
User-Defined Fields (UDF)	Fixed, increment or decrement by user-defined step, sequence, value list, and random configurations.	
Error Generation	Bad checksum generation	
Hardware Checksum Generation	Checksum generation and verification for IPv4	
Latency Measurement Resolution	3.2 nanoseconds	
Receive Feature Specifications		
Receive Engine	Wire-speed packet filtering, capturing, real-time latency, and inter-arrival time for each packet group, with data integrity, sequence and advanced sequence checking capability	
Trackable Receive Flows per Port	4096 trackable flows per port 4096 flow groups per port	

Minimum Frame Size	64 bytes at full line rate into the capture buffer
Capture Buffer	512 MB per port
Statistics and Rates	Link state, line speed, frames sent, valid frames received, bytes sent/received, fragments, undersize, oversize, CRC errors, VLAN tagged frames, 6 user-defined stats, data integrity frames, data integrity errors, sequence and advanced sequence checking frames, sequence checking errors, Qbv Gate Statistics
Latency / Jitter Measurements	Cut-through, store and forward

Novus mini Pro

Number of Ports	6-Port
Port Speeds	2.5GE/1GE/100M/10M
Part number	NTNM01000A option 006
Hardware Specifications	
Physical Interfaces	RJ-45
CPU and Memory	Multicore processor with 16 GB of CPU memory per appliance
Cable Media	CAT5e CAT6 CAT6A
Appliance Dimensions	3.11” (H) x 9.44” (W) x 8.85” (D) 79 mm (H) x 240 mm (W) x 225 mm (D)
Appliance Weights	Appliance only: 9.7 lbs (4.4 kg)
Temperature (Ambient Air)	Operating: 32 °F to 104 °F (0 °C to 40 °C) Storage: -13 °F to 185 °F (-25 °C to 85 °C)
Power	Input: 100 – 240 VAC, 50-60 Hz, 1.4 A Output: 20 VDC, 6 A, Max power: 120 W
Humidity (Ambient Air)	Operating: 10 % to 90 %, non-condensing Storage: 0 % to 85 %, non-condensing
Transmit Feature Specifications	
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Stream Controls	Rate and frame size change on the fly, sequential and advanced stream scheduler
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Maximum Frame Size	1500 bytes
Maximum Jumbo Frame Size	9728 bytes
Frame Length Controls	Fixed, increment by user-defined step, weighted pairs, uniform, repeatable random, IMIX, and Quad Gaussian
User-Defined Fields (UDF)	Fixed, increment or decrement by user-defined step, sequence, value list, and random configurations
Error Generation	Bad checksum generation
Hardware Checksum Generation	Checksum generation and verification for IPv4
Latency Measurement Resolution	3.2 nanoseconds

Receive Feature Specifications	
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Minimum Frame Size	64 bytes at full line rate into the capture buffer
Capture Buffer	512 MB per port
Statistics and Rates	Link state, line speed, frames sent, valid frames received, bytes sent/received, fragments, undersize, oversize, CRC errors, VLAN tagged frames, 6 user-defined stats, data integrity frames, data integrity errors, sequence and advanced sequence checking frames, sequence checking errors, Qbv Gate Statistics
Latency / Jitter Measurements	Cut-through, store and forward

Novus mini and Novus mini Pro

Layer 2-3 Protocol Support	
Routing and Switching	BGPv4 / BGPv6 ISISv4 / ISISv6 OSPFv2 / OSPFv3 PIM-SM / PIM-SSM BFD STP / RSTP / MSTP LACP / Static LAG / Protocols over LACP (PoLACP)
MPLS	RSVP-TE P2P / RSVP-TE P2MP LDP / LDPv6 / mLDP L3 MPLS VPN / 6VPE / 6PE L2 LDP VPN / PWE / VPLS BGP VPLS / VPWS BGP RFC3107 EVPN / PBB-EVPN Multicast VPN NG MPLS OAM MPLS over GRE MPLS over UDP
Broadband and Authentication	PPPoE / L2TPv2 DHCPv4 / DHCPv6 DHCPv4 / DHCPv6 over EoGRE IPv6 Autoconfiguration (SLAAC) Bonded GRE IGMP / MLD 802.1x ANCP
Time Sensitive Networking	IEEE 802.1AS-2011 and IEEE 802.1AS-2020 (General Precision Time Protocol), IEEE 802.1Qav (Forwarding & Queuing of Time Sensitive Streams), IEEE 802.1Qbv (Enhancements for Scheduled Traffic), IEEE 802.1Qat (Stream Reservation Protocol), IEEE 802.1CB (Frame Replication and Elimination), IEEE 802.1Qci (Per Stream Filtering & Policing), IEEE 1722 (AVTP), Netconf
TSN over 5G (Only on Novus mini Pro)	TSN protocols for 5G Networks, includes NW-TT and DS-TT emulation.
Industrial Ethernet	CFM IEEE 802.1ag Service OAM ITU-T Y.1731, IEEE 1588v2 (PTP)
Data Center Ethernet	DCBX / LLDP FCoE Forwarder FabricPath TRILL
Software Defined Network (Only on Novus mini Pro)	Segment Routing BGP Prefix SID, Segment Routing ISIS, Segment Routing OSPF, Segment Routing v6 / G-SRv6, Segment Routing v6 / G-SRv6 OAM, BGP FlowSpec, BGP Link State (BGP-LS), BGP SR TE Policy, BIER, OpenFlow, OVSDB, PCEP, S-BFD, GENEVE, VXLAN, VXLAN EVPN, ISIS / OSPFv2 Flex-Algo, gRIBI

Keysight Network Conformance (KNC)

Keysight TSN Conformance for Novus mini and Novus mini Pro (NTNCM0100A)

Standard	Coverage Area	Scenarios
IEEE 802.1AS - Timing & Synchronization	Sequence Id validation Pdelay request interval validation Announce message validation Message packet format validation	15
IEEE 802.1AS-2020 - Timing & Synchronization for TSN	Domain number validation PTP Message Header Validation	7
IEEE 802.1Qbv - Time Aware Shaper	Verification of Gate Open & Gate Close States Verification of queueMaxSDU Verification of minimum & maximum cycle time Verification of transmission window Verification for Window Violation Verification for Configuration Update over Netconf	23
IEEE 802.1Qci - Per Stream Filtering & Policing	Verification of "GateClosedDueToInvalidRx" scenario Verification of "GateClosedDueToOctetsExceeded" scenario Verification of "StreamBlockedDueToOversizeFrame" scenario	15
IEEE 802.1CB - Frame Replication & Elimination for Reliability	Verification of Stream Identification Function Verification of Stream Replication Verification of Stream Recovery Function	18

Avnu Conformance Bundle for Novus mini and Novus mini Pro (NTNCM0200A)

Standard – Component	Coverage Area	Scenarios
IEEE 802.1AS – 2020 Timing & Synchronization (Both For Bridges and End points)	Common Minimal Time Aware System Site Sync State Machine Validation Port Sync Receive State Machine Validation Clock Slave Sync State Machine Validation Best Leader Clock Algorithm Validation Port Announce Receive State Machine Validation Port Announce Information State Machine Validation Port Role Selection State Machine Validation Clock Master State Machin Validation Media-independent Leader Validation Port Announce Transmit State Machine Validation Media Dependent, Full Duplex, Point to Point Link Validation Sync Receive State Machine Validation Sync Send State Machine Validation Pdelay Req State Machine Validation Pdelay Resp State Machine Validation gPTP Management Avnu Specific Test Cases for gPTP Signaling Message Conformance Bridge Specific Test Cases	153

IEEE 802.1Qbv - Time Aware Shaper (Both for Bridges and End Points)	Verification of transmission & rejection behavior for bridges and end points Verification of Cycle Time Verification of Cycle time duration not equal to control list duration Dynamic Schedule Changes Validate maximum dynamic schedule change request to schedule change interval	26
Standard – Switch	**Coverage Area**	**Scenarios**
IEEE 802.1Q – Forwarding & Queuing of Time Sensitive Streams. (Only Bridges)	Non-SR Traffic Bandwidth is Work Conserving One SR class, One Ingress, One Egress Algorithm Validation One SR class and Line-Rate interfering traffic Maximum Reservation check Minimum Reservation and FDB check AVB Boundary ports properly regenerate per SR class	9
Standard - Industrial	**Coverage Area**	**Scenarios**
IEEE 802.1Qbv - Time Aware Shaper (For Bridges)	Verification of transmission & rejection behavior for bridges Verification of Cycle Time	17
Standard - Automotive	**Coverage Area**	**Scenarios**
IEEE 802.1AS – 2011 Timing & Synchronization (Both For Bridges and End points)	Section 1 – gPTP Tests Derived from Automotive CDS Specification Common AED Test Cases AED with Master Ports AED with Slave Ports AED Bridge only tests Section 2 – Automotive gPTP Tests Derived from IEEE 802.1AS Minimal Time Aware System Site Sync State Machine Port Sync Receive State Machine Clock Slave Sync State Machine Clock Master State Machine Media Dependent, Full Duplex, Point to Point Link Sync Receive State Machine Sync Send State Machine Pdelay Request State Machine Pdelay Response State Machine Signaling Messages Avnu Specific Test Cases for gPTP Section 3 – Bridge Specific Test Cases Site Sync State Machine Port Sync Send State Machine Media Dependent Point to Point full duplex link Sync Send State Machine Avnu Specific Tests for gPTP	104

End station Test Plan for Automotive Media Formats and SR Classes	Section 1 – AVTP General Requirements for Automotive Ethernet Devices (AEDs) AED AVTP Common Header Talker Format Tests AED AVTP Common Stream Header Talker Format Tests Section 2 – AED-V MPEG-TS 61883-4 Video Formats AED-V MPEG-TS 61883-4 Talker Tests Section 3 – AVTP Audio Format (AAF) AED-A AAF Talker Format Tests AED-A AAF Talker Additional Requirements AED-A Listener Tests Section 4 – AED-V Compressed Video Formats (CVF) AED-V MJPEG CVF Talker Tests AED-V MJPEG CVF End station Functional Verification AED-V H264 CVF Talker Tests AED-V H.264 CVF Endstation Functional Verification AED-V Additional CVF Requirements Section 5 – Audio Clock Reference Format AED-C Audio Sample CRF (CRF-A) Talker Tests AED-C Audio Sample CRF (CRF-A) Listener Tests Section 6 – Stream Reservation Classes 1. Stream Reservation AED Endstation Talker / Listener Tests	73
Test Plan for Automotive Exception Handling	Section 1 – Exception Handling Ethernet Exceptions IEEE 802.1AS Exceptions IEEE 1722 Media Stream Exceptions	29
Test Plan for Automotive Diagnostic Counters	Section 1 – Diagnostic Counters gPTP Diagnostic Counters 1722 Diagnostic Counters	34
Test Plan for Automotive Network & Device Startup	Section 1 – Network and Device Startup Ethernet Interface Configuration States and Events Test Mode and Status Message Structure	21
Bridge Test Plan for Automotive SR Classes and Forwarding and Queuing Enhancements for Time-Sensitive Streams	Section 1 – Forwarding and Queuing for Time-Sensitive Streams Forwarding Process Validation Credit-Based Shaper Algorithm Validation Priority Regeneration on Bridge supporting AVB and non-AVB Domain ports	21

Keysight Technologies is an approved certification lab tool.

Ordering Information

Novus mini hardware (required)

Part number	Options	Description
NTNM00100A	003 – 3 ports	Includes Novus mini chassis with 3 ports and a management port with the included USB to Ethernet adapter
NTNM00100A	004 – 4 ports	Includes Novus mini chassis with 4 ports and a management port with the included USB to Ethernet adapter. Also includes 1pps (input), 1pps (output) and 10 MHz (output)

Novus mini Pro hardware (required)

Part number	Options	Description
NTNM01000A	006 – 6 ports	Includes Novus mini Pro chassis with 6 ports and a management port. Also includes 1pps (input), 1pps (output) and 10 MHz (output)

IxNetwork web edition (required)

Part number	Options	Description
NTNM00100A	003 – 3 ports	Includes Novus mini chassis with 3 ports and a management port with the included USB to Ethernet adapter
NTNM00100A	004 – 4 ports	Includes Novus mini chassis with 4 ports and a management port with the included USB to Ethernet adapter. Also includes 1pps (input), 1pps (output) and 10 MHz (output)
NTNM01000A	006 – 6 ports	Includes Novus mini Pro chassis with 6 ports and a management port. Also includes 1pps (input), 1pps (output) and 10 MHz (output)
NTXNM0100A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	IxNetwork Basic package for Novus mini and Novus mini Pro. Includes RFC2544/2889/3918 Quicktest
NTXNM0150A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	IxNetwork Basic plus gPTP for Novus mini and Novus mini Pro. Includes gPTP (802.1AS-2011 and 802.1AS-2020)
NTXNM0200A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	IxNetwork Basic plus TSN for Novus mini and Novus mini Pro. Includes TSN – gPTP (802.1AS-2011 and 802.1AS-2020), Qbv Scheduled Traffic,1CB Redundancy, Qav CBS, MSRP, 1722 and 1733 protocol and Netconf
NTXNM1000A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	IxNetwork Advanced package for Novus mini and Novus mini Pro. Includes TSN and routing protocols
NTXNM1100A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	IxNetwork Professional package for Novus mini Pro. Includes TSN, 5G protocols for TSN (NW-TT and DS-TT emulation), Routing protocols, SDN protocols

Keysight Network Conformance (KNC) (optional)

Part number	Options	Description
NTNCM0100A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	Avnu Conformance Bundle for Novus mini. Includes automated test for Avnu Automotive, Industrial, Component and Switch test plans
NTNCM0200A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	Keysight TSN Conformance for Novus mini. Includes automated test for 802.1AS, 802.1Qbv, 802.1Qci, 802.1CB
NTNCM0300A	SW-LIC-01 Perpetual license SW-SUB-01 Subscription	Bundle of Avnu Conformance Bundle (NTNCM0100A) and Keysight TSN Conformance (NTNCM0200A)

More information

For more information, see the following URL:
https://www.keysight.com/us/en/products/network-test/network-test-hardware/novus-mini.html