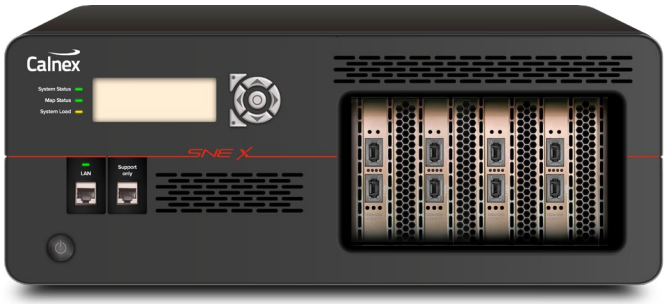
Calnex

Scalable, High Performance Network Emulation

Apply precise impairments across multiple high-speed network links

Calnex SNE-X supports Ethernet interfaces from 1GbE to 400GbE



Calnex SNE-X

Recreate real-world network conditions

Modern applications and infrastructure must perform reliably across high-speed links, complex traffic flows, and constantly changing network conditions. However, systems tested only under ideal lab conditions can behave very differently when exposed to latency, jitter, packet loss, congestion, bandwidth constraints, reordering, and other network impairments.

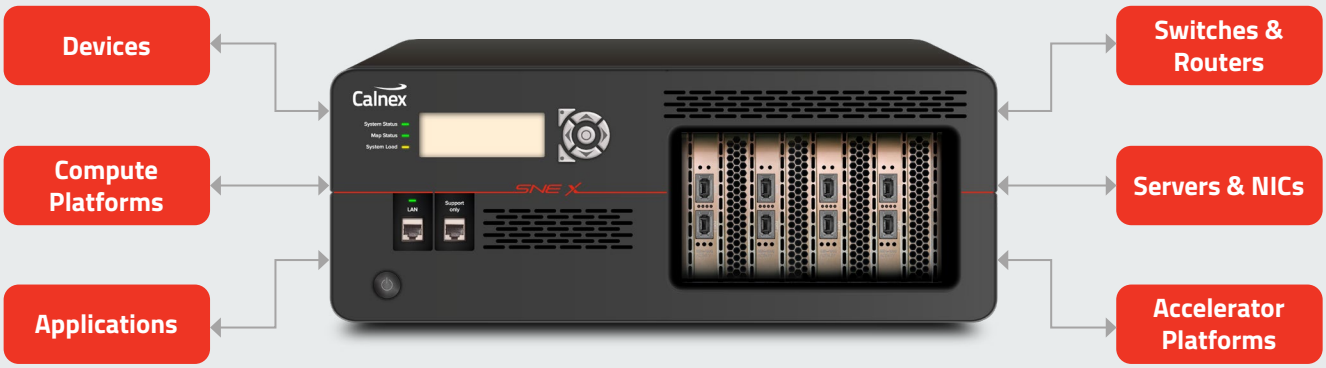
The Calnex SNE-X brings these conditions into the lab. It enables engineering teams to apply precise, repeatable impairments across network paths, helping them validate application and infrastructure performance before deployment, reproduce field issues, and understand how systems respond under stress.

High-performance impairment testing at scale

At higher Ethernet speeds and across multiple simultaneous test paths, the network emulator must not become the performance bottleneck. SNE-X combines a high-performance backplane, speeds up to 400GbE, maximum intrinsic latency of 20µs, and Any Port to Any Port™ connectivity to support demanding impairment tests across complex network topologies.

With up to 28 ports, multiple devices, links, and traffic flows can be tested in parallel from a single platform, increasing test coverage and lowering the cost per test as requirements scale.

Apply impairments across multiple simultaneous bidirectional test paths



Scale

Up to 28 ports
Parallel testing
Hundreds of flows

Performance

Up to 400GbE
Low intrinsic latency
Wire-rate performance

Flexibility

Any Port to Any Port
Independent conditions
Flow-specific impairment

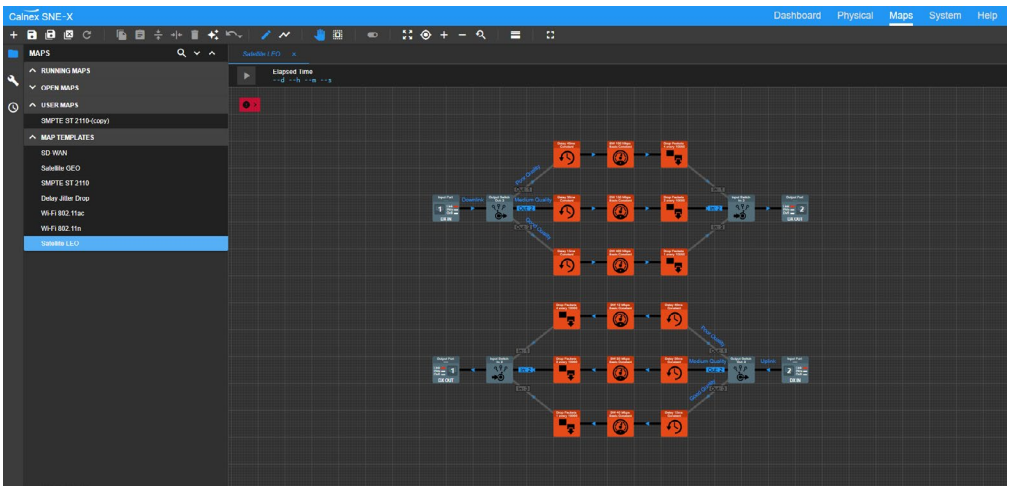
Control complex, repeatable test scenarios

SNE-X enables engineers to target selected traffic streams and apply different impairments by flow, direction, or network path while unaffected traffic continues normally. Test conditions can be changed over time, repeated, and automated, supporting consistent performance, interoperability, regression, and fault-reproduction testing.

Build and control tests through an intuitive GUI

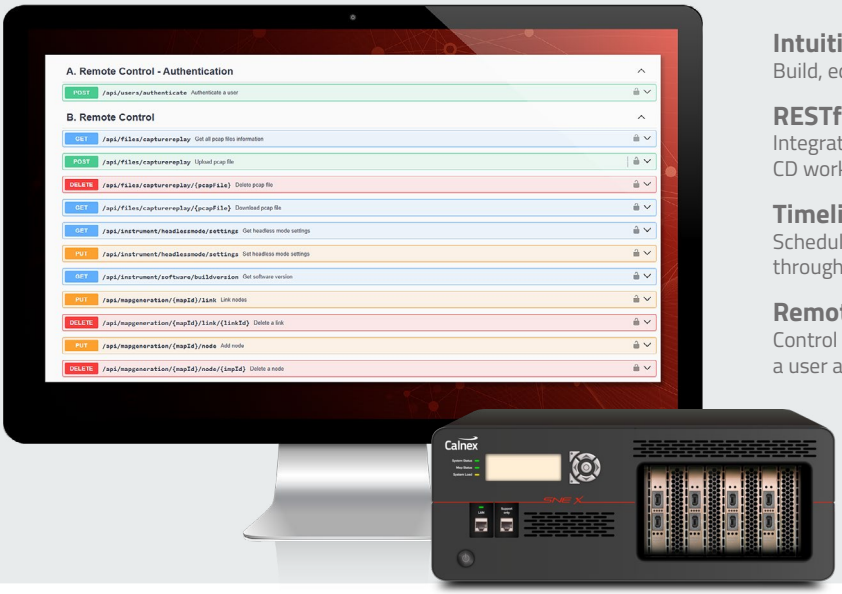
The browser-based GUI enables engineers to create network maps visually, connect test paths, configure traffic filters and apply impairments without writing code. Test conditions can be adjusted while a test is running, making it easy to explore system behavior, troubleshoot unexpected results, and refine scenarios during development.

Clear visual representation of ports, traffic paths, and impairment functions helps engineers understand complex configurations and move quickly from initial setup to active testing.



Integrate impairment emulation into automated workflows

The SNE-X RESTful API enables remote configuration and control from customer-developed scripts, test frameworks and lab automation platforms. Tests can be executed consistently across different devices, software releases and hardware revisions with less manual intervention.



Intuitive Web GUI
Build, edit and monitor complex network scenarios visually.

RESTful API
Integrate repeatable network testing into automated lab and CI/CD workflows.

Timeline automation
Schedule changing conditions, faults, and recovery events throughout a test.

Remote operation
Control shared lab resources and execute tests without requiring a user at the instrument.

Flexible test resources for teams and shared labs

SNE-X can be configured around changing project requirements, from focused device tests to larger multi-device environments. Any Port to Any Port™ connectivity allows test paths and resources to be assigned flexibly across the platform, enabling multiple users or projects to work independently and run tests in parallel.

As development needs change, the same scalable hardware platform can support different devices, interface speeds, port configurations, and network topologies. This reduces the need for separate emulators for each test setup, helping centralized labs expand test capacity, improve equipment utilization, and lower the cost per test across development, integration, and regression programs.

Built for high-speed Ethernet validation

From 1GbE through to 10, 25, 50, 100, and 400GbE, SNE-X provides a single scalable platform for validation. Designed for customers whose testing requirements continue to scale and even move toward higher interface rates, SNE-X combines wire-rate performance, low intrinsic latency, high port density, and flexible Any Port to Any Port™ connectivity. Teams can progress from focused device testing to parallel, multi-system environments without deploying a different network emulator each time test complexity increases.

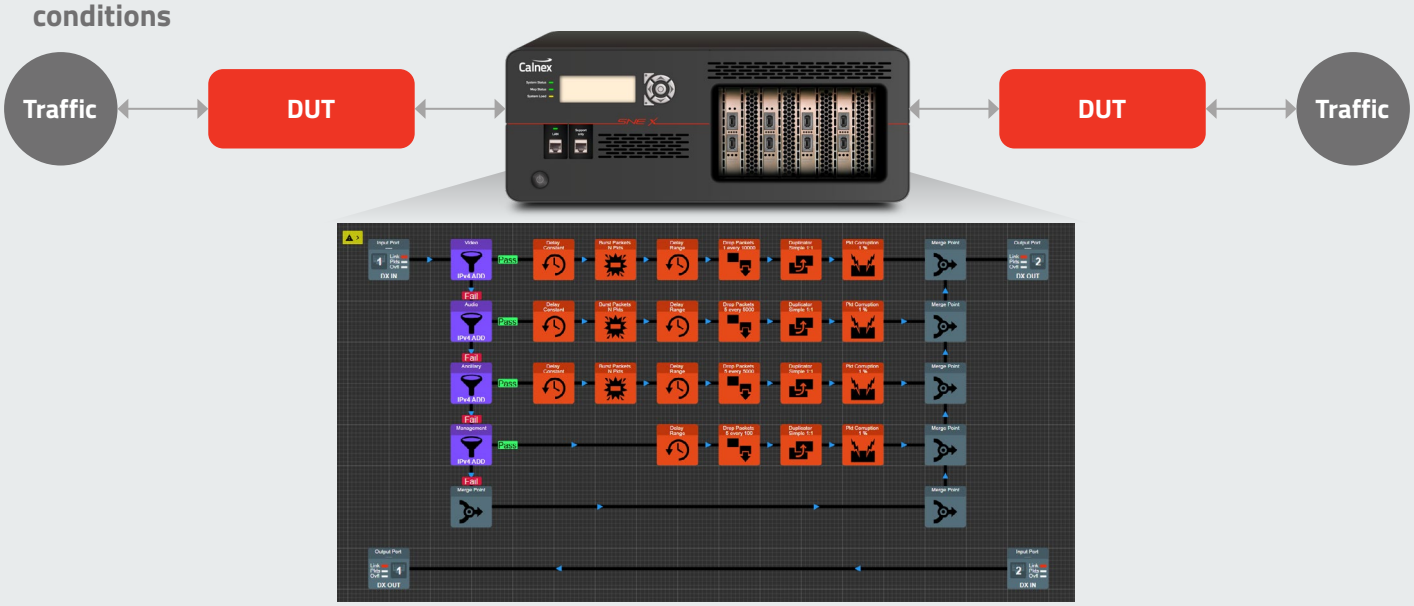
Validate high-speed silicon, systems, and network infrastructure

SNE-X is suited to the development and validation of high-speed Ethernet chipsets, routing and switching platforms, accelerator systems, data center interconnects, and other throughput- and latency-sensitive infrastructure.

Assure performance across critical network environments

SNE-X helps organizations validate the resilience of networks supporting defense, telecom, banking and financial services, energy, transportation, and other critical operations. By recreating controlled latency, jitter, packet loss, congestion, bandwidth constraints, teams can evaluate service continuity, failover behavior, and application performance before deployment or network change.

Create complex controlled and repeatable network conditions



Key Highlights

- **Up to 28 ports** – impair hundreds of packet streams simultaneously from a single platform.
- **1 to 400GbE wire-rate emulation** – validate applications and infrastructure across a wide range of Ethernet speeds.
- **Low intrinsic latency** – a maximum of 20µs supports accurate testing of latency- and throughput-sensitive applications.
- **Any Port to Any Port™** connectivity – create flexible test paths between interfaces and test multiple devices simultaneously.
- **High-performance backplane** – run demanding, parallel impairment scenarios across multiple ports without compromising test performance.
- **Independent bidirectional emulation** – apply different network conditions in each direction to reproduce asymmetric paths.
- **Comprehensive network impairments** – recreate delay, jitter, packet loss, burst loss, reordering, corruption, duplication, and outages.
- **Flow-specific impairment** – target selected packet streams while allowing other traffic to pass unaffected.
- RESTful remote-control API – automate repetitive tests and integrate network emulation into broader test and regression workflows.
- **Visual web-based test creation** – build, edit, and control network maps through an intuitive browser interface.
- **Traffic capture and replay** – reproduce field traffic, investigate failures, and analyze packets using PCAP and Wireshark support.

Applications

- High-speed Ethernet silicon and chipset validation
- Server, NIC, DPU, and accelerator platform testing
- Switch, router, and network appliance development
- Data-plane performance and packet-processing testing
- Telecom Core, Midhaul and Mobile Edge testing
- Multi-device interoperability testing
- Data center interconnect validation
- Distributed compute and cloud infrastructure testing
- Application performance and resilience testing
- Field issue reproduction and troubleshooting

Use SNE-X to test

- AI inference
- AI/ML silicon
- Chipsets
- Servers, NICs, and DPUs
- Switches, routers, and network appliances
- High-performance applications and services
- Data center networks
- Cloud services
- SD-WAN, SASE and WAN edge platforms
- Telecom transport infrastructure
- Multi-vendor network environments
- Network operating systems and firmware
- Critical infrastructure networks

Technical Specifications

	PRODUCT RANGE					
	1G	10G	25G	50G	100G	400G
Physical						
Number of ports per card	4	2	2	2	2	1
Maximum number of ports per SNE-X (4 full slots)	28	16	16	8	8	4
Supported rates	10 Mbit/s 100 Mbit/s 1 Gbit/s	1 Gbit/s 10 Gbit/s	1 Gbit/s 10 Gbit/s 25 Gbit/s	10 Gbit/s 25 Gbit/s 50 Gbit/s	25 Gbit/s 50 Gbit/s 100 Gbit/s	50 Gbit/s 100 Gbit/s 400 Gbit/s
Interface	RJ45 (GbE Copper)	SFP+	SFP28	QSFP28	QSFP28	OSFP
Max packet rate per port (Bi-Directional)	2.96 million pkt/s	29.6 million pkt/s	74.4 million pkt/s	148.8 million pkt/s	297.6 million pkt/s	Contact for info
Max. Frame Size — Jumbo Mode 9219 bytes; Non-jumbo Mode 1542 bytes	✓	✓	✓	✓	✓	✓
General						
Dimensions	4u Rack					
Intrinsic Latency	20µs					
Timing Precision	10µs					
Maximum Frame Size — Non-Jumbo Frame Mode	1544 bytes					
Maximum Frame Size — Jumbo Frame Mode	9219 bytes					
Any Port to Any Port™ packets can be sent between any port for complete flexibility	✓	✓	✓	✓	✓	✓
Multi-user support — Unlimited users, share maps, assign ports to individual users	✓	✓	✓	✓	✓	✓
Live Changes — Real-time modification of any impairment setting	✓	✓	✓	✓	✓	✓
Bi-directional, Independent Emulations	✓	✓	✓	✓	✓	✓
Drag and Drop user interface	✓	✓	✓	✓	✓	✓
Link Flap — Ports can be cycled on/off to simulate Link Flapping	✓	✓	✓	✓	✓	✓
Delay						
Delay Modes — Constant, Gaussian, Ramp, Range, Sinusoidal	✓	✓	✓	✓	✓	
Maximum Delay Emulation (Non-Jumbo Frame Mode)	1250ms at 1G	500ms at 10G	500ms at 25G	500ms at 50GbE	500ms at 100GbE	650ms at 400GbE
Maximum Delay Emulation (Jumbo Frame Mode)	1250ms at 1GbE	500ms at 10GbE	483ms at 25GbE	483ms at 50GbE	483ms at 100GbE	650ms at 400GbE
Maximum Extended Delay Emulation (Non-Jumbo Frame Mode)	30000ms at 1GbE	4070ms at 10GbE	2713ms at 25GbE	2713ms at 50GbE	2713.68ms at 100GbE	
Maximum Extended Delay Emulation (Jumbo Frame Mode)	7249ms at 1GbE	724ms at 10GbE	483ms at 25GbE	483ms at 50GbE	483ms at 100GbE	

✓ Provided as Standard

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Technical Specifications contd.

	PRODUCT RANGE					
	1G	10G	25G	50G	100G	400G
Bandwidth Emulation Limit						
Bandwidth Limit Threshold	8 bit/s to 100 Gbit/s					
Bandwidth Limit Modes — Constant Throttle, Random Range	✓	✓	✓	✓	✓	✓
Packet Drop						
Standard — Drop x packets in y received	✓	✓	✓	✓	✓	✓
Percentage — Drop 1% to 100% (in increments of 1%)	✓	✓	✓	✓	✓	✓
Markov — 2 state random packet drop (as per ITU-T G.1050 Appendix II - Gilbert-Elliott model)	✓	✓	✓	✓	✓	✓
Packet Reorder						
Packet Distance — Min/max distance of 0 to 10000 packets	✓	✓	✓	✓	✓	✓
Time — Min/max displacement of 0 to 500ms	✓	✓	✓	✓	✓	✓
Jitter						
Jitter — Range 0.01 to 100 ms	✓	✓	✓	✓	✓	✓
Packet Modifier						
Generic Packet Modifier — Modify any 1 to 4 bytes in packets and set to a specific value	✓	✓	✓	✓	✓	✓
Bit Error Rate						
Error Range — **Corrupt x bits in every y bits/kbits/Mbits**	✓	✓	✓	✓	✓	✓
Packet Corruption						
Overwrite Modes — Bitflips, Byte overwrite	✓	✓	✓	✓	✓	✓
Corruption Level — 0.1 to 100% of packet	✓	✓	✓	✓	✓	✓
Corruption Range — All contents of each packet, Start and end point within each packet	✓	✓	✓	✓	✓	✓
Packet Duplication						
Duplicator Modes — Complex – multiple, timed duplication	✓	✓	✓	✓	✓	✓
Duplicator Modes — Simple – 1:1 duplication of all packets	✓	✓	✓	✓	✓	✓
Duplicator Modes — Duplication every x seconds	✓	✓	✓	✓	✓	✓
Burst Packet						
Burst Modes — N Packets – Accumulates N packets before sending them in a burst	✓	✓	✓	✓	✓	✓
Burst Modes — Timeout – Accumulates packets until the specified time has elapsed, then sends them in a burst	✓	✓	✓	✓	✓	✓
Burst Modes — N Packets OR Timeout – Sends the accumulated packets when either condition is met	✓	✓	✓	✓	✓	✓
Burst Modes — Packets AND Timeout – Sends the ac- cumulated packets when both conditions are met	✓	✓	✓	✓	✓	✓
Packet Fragmentor						
Maximum MTU Range	✓	✓	✓	✓	✓	✓

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Technical Specifications contd.

	PRODUCT RANGE					
	1G	10G	25G	50G	100G	400G
MPEG Video Corrupter						
Video Format Codecs — 0.01 to 100 ms	✓	✓	✓	✓	✓	✓
IDR Frame Corruption — For every x frames, corrupt y frames, affecting z% of the frame. Optionally drop n frames	✓	✓	✓	✓	✓	✓
Non-IDR Frame Corruption — Corrupt I, B and/or P frame	✓	✓	✓	✓	✓	✓
Checksum Correction — Fix IP Header Checksum Fix IP UDP Header Checksum	✓	✓	✓	✓	✓	
Decoder Notifications — Non RTP/MPEG packet received. Frame with forbidden flag received Unsupported NAL frame received	✓	✓	✓	✓	✓	✓
Filters						
Maximum Number of Filters Per Map — Connect multiple filters in any way to create complex filter rules	Unlimited					
Filter Types						
IPv4/IPv6 Address (Source and/or destina- tion, specific address and range)	✓	✓	✓	✓	✓	✓
MAC Address (Source and/or destination, specific address and range)	✓	✓	✓	✓	✓	✓
IP Protocol (Industry or user defined)	✓	✓	✓	✓	✓	✓
VLAN (Single, range or multiple)	✓	✓	✓	✓	✓	✓
UDP (With or without port)	✓	✓	✓	✓	✓	✓
TCP (With or without port)	✓	✓	✓	✓	✓	✓
RTP (Industry or user defined)	✓	✓	✓	✓	✓	✓
RoCEv2 (IPv4/IPv6, OpCode, Queue Pair)	✓	✓	✓	✓	✓	✓
MPLS (Label, QOS value, TTL value)	✓	✓	✓	✓	✓	✓
Counting (Percent or x in y packets)	✓	✓	✓	✓	✓	✓
Diff Serv (DSCP AF Type or TOS value)	✓	✓	✓	✓	✓	✓
Payload (Industry or user defined)	✓	✓	✓	✓	✓	✓
Generic (Any single or multiple bytes within packets)	✓	✓	✓	✓	✓	✓
Packet Generation						
UDP Background Traffic	Constant or range Up to 10 Gbit/s Optionally send packets to broadcast address					
TCP Server Generator	Specify TCP source/destination MAC and IP address Up to 10 Gbit/s Generate multiple streams					
Traffic Replay	Replay from PCAP file Single replay or loop					

Specification is subject to change without notice.

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Technical Specifications contd.

	PRODUCT RANGE All interfaces: 1G, 10G, 25G, 50G, 100G, 400G
Analysis	
Bandwidth Graph	Show data rate over time Up to 1 hour sliding window Export as CSV file
Inter-Packet Gap Graph	Show average and/or min/max interpacket gap over time Up to 1 hour sliding window Export as CSV file
Packet Count Graph	Show number of packets per second over time Up to 1 hour sliding window Export as CSV file
Traffic Capture	Capture traffic as PCAP Total storage: 20GB volatile (RAM) or 1TB non-volatile (SSD) Capture file maximum size: RAM – 20GB, SSD – 524GB*
Wireshark	Capture traffic directly to Wireshark Max traffic capture rate 1 Gbit/s
Remote Control	
RESTful API	Easy remote control of impairments in an automation environment
Timeline	Schedule changes to impairments with no manual intervention required
Timing Constraints	Specify start and duration of individual impairments activity

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Calnex Solutions plc is a global leader in Test and Measurement solutions for next-generation telecom networks. Our products help to prove new technologies for applications such as SD-WAN, DataCenters, Cloud/OTT, Broadcast Video, and AV/Video conferencing.

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