

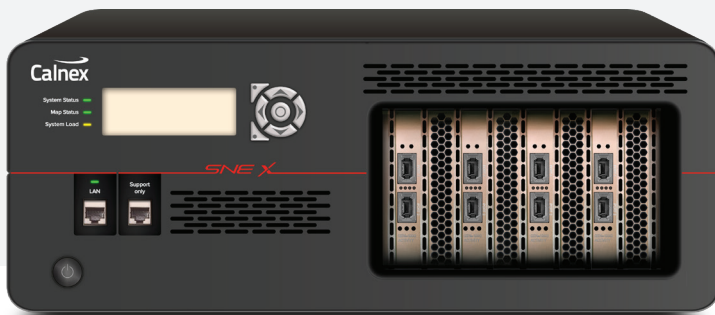
Calnex SNE-X

High Precision, Cost-effective Network Emulation

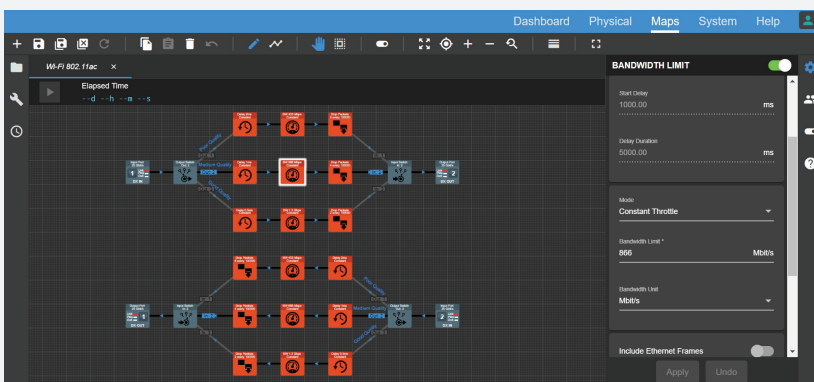
Test with real-world network conditions in your lab

The Calnex SNE-X is a multi-port, high-performance network emulator designed to drive product/application quality and reduce the cost of test with rigorous, scalable test capability. The Calnex SNE-X offers:

- Up to 28 ports – allows network impairment of hundreds of packet streams simultaneously.
- 1 to 100GbE wire rate – for emulating network conditions experienced by 5G services and applications.
- Low intrinsic latency – maximum intrinsic latency of 20µs is ideal for simulating throughput-sensitive applications.
- High performance backplane – allows simultaneous testing with “Any Port to Any Port”™.



The SNE-X provides industry-leading flexibility in building and modelling complex, real-life systems enabling you to simulate networks and emulate the real-world conditions under which applications and platforms need to perform.



Applications

The SNE-X is a total solution to the problem of real-world Ethernet testing. It combines comprehensive and efficient network emulation for:

5G

- Mobile Edge Computing
- Backhaul
- Midhaul
- Services (AR/VR, V2X etc)

Data Center

- Interconnect
- Management
- Migration

Cloud

- Infrastructure
- Application testing
- Device testing

The flexible Web UI enables you to drag and drop from the extensive list of impairments into your network “map” to create a range of impairment scenarios that can run simultaneously for fast, high-volume test.

Technical Specifications

Physical	Product Range				
	1G	10G	25G	50G	100G
Network Interfaces	up to 28	up to 28	up to 16	up to 8	up to 8
Standard Network Interfaces	GbE Copper	SFP+	SFP28	QSFP28	QSFP28
Optional Network Interfaces	RJ45	SFP+	SFP28	QSFP28	QSFP28
Max. Packet Rate Per Port (bi-directional)	TBD	TBD	TBD	TBD	TBD
Dimensions	2u Rack	2u Rack	2u Rack	2u Rack	2u Rack
Intrinsic Latency	<20µs	<20µs	<20µs	<20µs	<20µs
Max. Frame Size – Jumbo Mode 9219 bytes; Non-jumbo Mode 1542 bytes	•	•	•	•	•
General					
Timing Precision	10µs	10µs	10µs	10µs	10µs
Any Port to Any Port™ Packets can be sent between any port for complete flexibility	•	•	•	•	•
Live Changes – Real-time modification of any impairment setting	•	•	•	•	•
Traffic Capture and Replay with Looping Option Volatile Storage (20G RAM)	•	•	•	•	•
Non-volatile Storage (1TB SSD)* *Max Traffic Capture Rate 1Gb/s	optional	optional	optional	optional	optional
Bi-directional, Independent Emulations	•	•	•	•	•
Timeline – Schedule changes to emulation settings with no manual intervention required. Option: loop timeline for continuous playback	•	•	•	•	•
Link Flap	•	•	•	•	•

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Technical Specifications cont.

Delay Emulation – up to 4s at 25GbE; up to 4s at 10GbE; up to 10s at 1GbE; up to 30s (all rates at reduced bandwidth)	Product Range				
	1G	10G	25G	50G	100G
1GbE Delay Emulation – up to 1.25secs	•	•	•	•	•
10GbE Delay Emulation – up to 0.5secs	n/a	•	•	•	•
25GbE Delay Emulation – up to 0.5secs	n/a	n/a	•	•	•
50GbE Delay Emulation – up to 0.339secs	n/a	n/a	n/a	•	•
100GbE Delay Emulation – up to 0.339secs	n/a	n/a	n/a	n/a	•
Delay Emulation (at reduced bandwidth) – up to 30secs	•	•	•	•	•
1GbE Extended Delay Emulation – up to 10secs	optional	optional	optional	optional	optional
10GbE Extended Delay Emulation – up to 4secs	n/a	optional	optional	optional	optional
25GbE Extended Delay Emulation – up to 4secs	n/a	n/a	optional	optional	optional
50GbE Extended Delay Emulation – up to 2.714secs	n/a	n/a	n/a	optional	optional
100GbE Extended Delay Emulation – up to 2.714secs	n/a	n/a	n/a	n/a	optional
Fixed Latency	•	•	•	•	•
Variable Latency	•	•	•	•	•
Ramp	•	•	•	•	•
Normal / Gaussian	•	•	•	•	•
Sinusoidal Wave	•	•	•	•	•
Jitter – 0.1ms to 100ms or 0.1 to 100% of constant delay	•	•	•	•	•
Timing Constraints (specify start and duration of impairments activity) Start / Duration 0.01ms to 360,000ms (in 0.01ms increments)	•	•	•	•	•

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Technical Specifications cont.

Bandwidth Emulation (with user configurable buffer size up to 20Mbytes for video)	Product Range				
	1G	10G	25G	50G	100G
Constant Throttle	128bits/sec to 1G	128bits/sec to 1G	128bits/sec to 1G	128bits/sec to 1G	128bits/sec to 1G
Random Range (min to max with time constraints)	128bits/sec to 1G	128bits/sec to 1G	128bits/sec to 1G	128bits/sec to 1G	128bits/sec to 1G
Random Range Duration – 1000ms to 60 minutes (in 0.1ms increments)	•	•	•	•	•
Background Traffic Generation					
Fixed Data Rate Generate broadcast packets Range (min to max with time constraints)	500byte/sec to 1G	500byte/sec to 1G	500byte/sec to 1G	500byte/sec to 1G	500byte/sec to 1G
Range Duration 1000ms to 360,000ms (in 1ms increments)	•	•	•	•	•
Reordering					
Time Based Re-order Displace packet from 0.1ms to 500 ms	•	•	•	•	•
Position Base Re-order Displace packet up to 10,000 places	•	•	•	•	•
Corruption					
Bitflips Start and end position (first byte to last byte), 1 to 100%	•	•	•	•	•
Byte Overwrites Start and end position (first byte to last byte), 1 to 100%	•	•	•	•	•
Ethernet Fragmentation MTU: 68 to 9000	•	•	•	•	•
Bit Error Rate (Per) Simulation x bits in y received (1 bit to 1E+15)	•	•	•	•	•
Enable/Disable FCS	•	•	•	•	•

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Technical Specifications cont.

Duplication	Product Range				
	1G	10G	25G	50G	100G
Simple (single duplication) Packets received on link will be immediately duplicated once	•	•	•	•	•
Timed (duplicated every x seconds) Single duplication after specified delay (1ms to 10,000ms)	•	•	•	•	•
Complex (multiple, timed duplication) Specified multiple duplications after specified time delay (1ms to 1,000ms)	•	•	•	•	•
Loss					
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)	•	•	•	•	•
Outage – Drop all packets received on specified link	•	•	•	•	•
Drop Evenly – Packets will be dropped regularly throughout emulation	•	•	•	•	•
Drops in Bursts – Packets will be dropped in continuous groups	•	•	•	•	•
Timing Constraints – Start / Duration 0.01ms to 360,000ms (in 0.01ms increments)	•	•	•	•	•

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Technical Specifications cont.

	Product Range
Modification	All interfaces 1G, 10G, 25G, 50G, 100G
Generic Packet Modifier Modify up to 6 bit / byte sections per packet	•
Analysis (Extract analysis information from any part of the emulation)	
Bandwidth Graph Show bandwidth utilization – export, clipboard, peak and averaging, etc.	•
Packet Rates Show packet utilization, Inter Packet Gap	•
RTP Analyser Output detailed information on RTP streams	optional
Stateless load generation with multiple load distribution models	
TCP Client Simulate clients with data streams	optional
TCP Server Simulate servers with data streams	optional
DDOS Simulation Simulate extremely stressful DDOS environments	optional
Audio Visual (AV) Pack	
RTP Filter	optional
MPEG H.264 and H.265 Corruptor	optional
Management	
Drag and Drop User Interface – Simple User Interface, allowing user to draw out their target network on screen, drop impairments as required and visualise the network-under-test	•
RESTful API for Test Automation	•
Smart Start-up Automatically launch previous map on boot	•

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Technical Specifications cont.

Filtering (UDP, TCP, Packet count)	Product Range
	All interfaces 1G, 10G, 25G, 50G, 100G
Maximum Filter – Connect multiple filters in any way to create complex filter rules	unlimited
IP Source / destination address filtering (impair specific traffic flows)	•
TCP – Advanced: Source and destination port filtering (including range) TCP Packet length filtering	•
UDP – Advanced: Source and destination port filtering (including range) UDP Packet length filtering	•
MAC Address – Src / Dst single or range	•
Ethernet Payload	•
Packet Counting – Fail or Pass packets based on packet count or percentage	•
Advanced Filtering	
Generic Filter – Filter on multiple bit / byte values with logic operations	•
IP Protocol – Payload Type and Value	•
MPLS – MPLS Label, QoS Value, TTL Value	•
VLAN – VLAN ID, User Priority	•
MPEG Video	optional
RTP A/V	optional
Reporting	
Live Monitoring – Bandwidth monitoring, packets per second, interpacket gap, export to CSV max / average values, etc.	•
Wireshark Integration (on up to 200 protocols) Allows for live traffic capture and root cause analysis; replay third-party traffic streams under impairments, record traffic and replay at a later date	•

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