VALKYRIE™

Probably the world's best
stateless traffic generation
and analysis platform

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OVERVIEW	TYPES OF TESTS	HARDWARE	SOFTWARE	AUTOMATION	KEY FEATURES

LEARN MORE

OVERVIEW

Valkyrie is a full-featured stateless traffic generator and analysis platform. It is used to configure and generate Layer 2-3 Ethernet traffic - at all speeds up to 400GE - and analyze how network devices and services perform in response. This makes it ideal for most lab-based data-plane test scenarios.

1

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OVERVIEW

Valkyrie and you

WHO USES VALKYRIE?

- NEMs
- Government & Defense
- Semiconductors
- Automotive & Aerospace
- Network Service Provider
- Energy & Utility
- Finance
- Academia

WHAT DUTs CAN YOU TEST?

- Switches
- Wireline & Wireless Networks
- NICs
- GPON Devices
- Cable modems
- Packet Brokers
- Transceivers and Cables
- ASIC emulators

WHAT TYPES OF TESTING?

- Performance Testing
- Functional Testing
- QoS and Service Validation
- Security
- Convergence
- Quality Assurance Testing

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Why choose Valkyrie

PRICE/PERFORMANCE

- Competitive HW prices

- Free SW licenses

- 3 years' free SW updates

- 3 years' HW warranty

- Free lifetime tech support

EASE OF USE

- Intuitive UI ("2-clicks" to get a stream running)

- Simple licensing system

- Fast, smooth chassis software upgrade process

- Multi-user platform with port reservation resolution down to one port per user

UNIQUE PRODUCT FEATURES

- Industry's only UI integrated Traffic Generation & Impairment solution (Valkyrie & Chimera)

- Industry's best automation & scripting options (same CLI and RESTapi commands across all port speeds)

- Test both PAM4 based speeds (400GE, 200GE, 100GE, 50GE) and NRZ based speeds (100GE, 50GE, 40GE, 25GE, 10GE) with 1 test module (Thor-400G-7S-1P)

ROCK SOLID PLATFORM

- Very robust chassis platform (Linux), runs "forever", supporting +40-day test cases

- Compact 1U ValkyrieCompact chassis covers all NRZ & PAM4 speeds up to 400GE

- Very precise and accurate traffic generation

- Industry's best traffic scheduler

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System Diagram
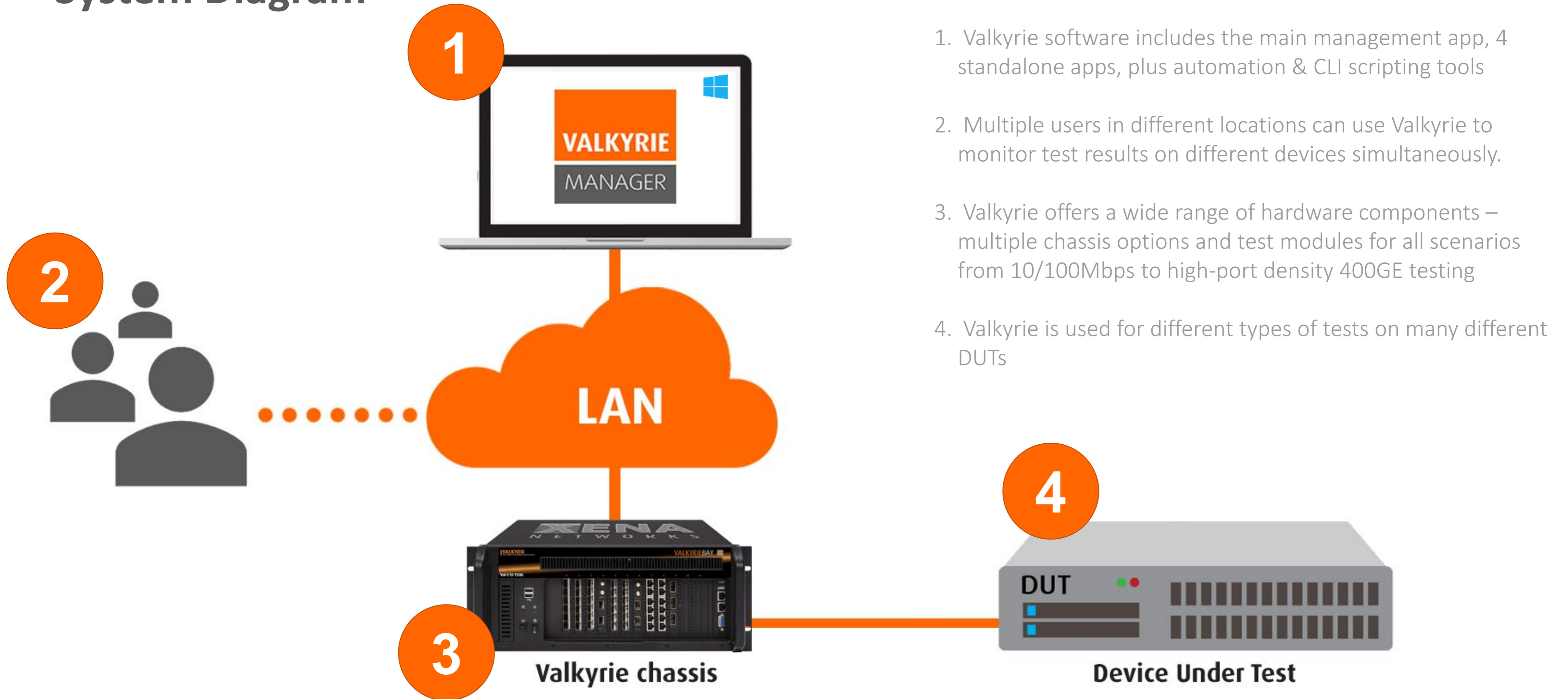
1. Valkyrie software includes the main management app, 4 standalone apps, plus automation & CLI scripting tools

2. Multiple users in different locations can use Valkyrie to monitor test results on different devices simultaneously.

3. Valkyrie offers a wide range of hardware components – multiple chassis options and test modules for all scenarios from 10/100Mbps to high-port density 400GE testing

4. Valkyrie is used for different types of tests on many different DUTs

TYPES OF TESTS

Valkyrie is typically used for these core test solutions

2

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TYPES OF TESTS
Performance Testing

Performance testing focuses the performance of a DUT via parameters like maximum throughput, latency and jitter.

Valkyrie provides comprehensive generation and analysis of Ethernet traffic including analysis of throughput, latency, jitter, loss, sequence, and misorder errors. Results can be presented in easy to understand tables, charts and histograms and documented in customizable reports.

- Stream Oriented Traffic generation and reception
- Statistics tracked per stream, or user-defined packet header filters
- Analysis of throughput, latency, jitter, loss, sequence, and misorder errors
- Generate 100'k unique traffic flows using Modifiers
- Generate stream based on import of PCAP files
- Real-time performance logging with charting and histograms
- Reporting in PDF or HTML files
- Polling of counters with logging to CSV or XML file
- Wire-speed and event triggered packet capture and export to Wireshark

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TYPES OF TESTS

Functional Testing

Functional testing verifies the basic functionality of the DUT and will depend on the DUT and the application.

Valkyrie provides a wide range of features for functional testing, including PCS and PMA Layer testing and microbursts and random IFG testing.

- Multicast
- 40/100/400G PCS and PMA Layer
- Energy Efficient Ethernet (EEE)
- Microbursts and random IFG
- Custom packet headers via templates or fully user specified
- Easy to use graphical (UI) based scheduling function

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Certification & Interoperability

Being able to verify and document that devices and services meet international standards for performance and interoperability is an important test scenario.

Xena participates regularly in interoperability testing events.

Valkyrie is used for certification testing of G.fast per IR-337 which provides a set of functional, stability, and basic performance test cases and related pass/fail requirements for G.fast implementations according to ITU-T Recommendations G.9700 and G.9701.

For GPON devices, Valkyrie is used to perform the tests described in the Broadband Forum's specification OD-247/IR-247.
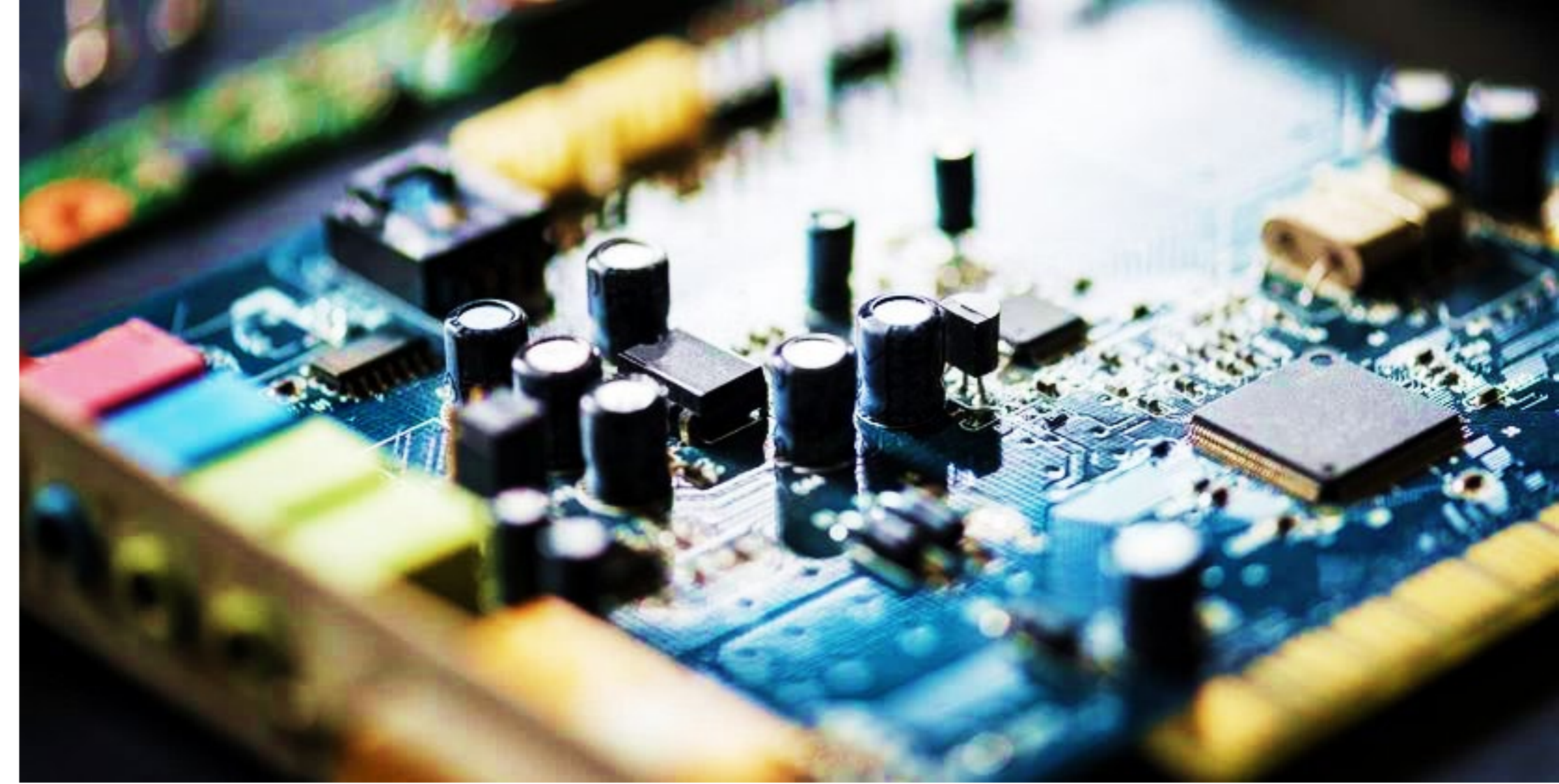
Valkyrie is used for certification & interoperability testing:

- G.fast per ID-337
- GPON per TR-247/ATP-247/TR-255

WHITE PAPERS

GPON Testing

G.fast

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Quality Assurance Testing

Quality Assurance (QA) gives companies a systematic way to maximum consistent product quality by minimizing errors and mistakes in products. QA testing typically includes stress testing of environmental conditions, e.g. EMC tests, mechanical drop and shock tests, heat and humidity tests.

When testing Ethernet products Valkyrie is used to generate Ethernet traffic from outside a test chamber into the DUT to verify it performs as expected. Other features like timestamping of results and industry-leading automation options make Valkyrie ideal for QA testing.

- RFC2544
- Throughput analysis
- Lost packets statistics
- Latency analysis

WHITE PAPERS

Quality Assurance

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QoS & Service Validation

Valkyrie offers QoS validation solutions in accordance with RFC 2544 and Y.1564, as well as advanced statistics functions that help users track, analyze and troubleshoot QoS to maintain a high service quality guarantee.

ValkyrieManager offers charting, histogram and latency/jitter analysis of test traffic. Testing that link performance complies with a Service Level Agreement (SLA) includes verifying Frame Transfer Delay (FTD), Frame Delay Variation (FDV) and Frame Loss Ratio (FLR) at the Committed Information Rate (CIR) defined in the SLA.

Verifying the SLA with Valkyrie1544 allows doing the test on a line simultaneously loaded with traffic from other services.

- Charting and histograms
- Background traffic injection
- Jitter analysis
- One-way latency analysis
- Inline measurements mode

- ITU-T Y.1564
- Live Monitoring
- Proactive Testing
- Wholesale Ethernet
- Performance Logging

WHITE PAPERS

| Latency & Jitter | Time Synchronization | Quality of Service | SD-WAN |

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Benchmarking

Xena offers QoS validation solutions in accordance with RFC 2544 and Y.1564, as well as advanced statistics functions that help users track, analyze and troubleshoot QoS to maintain a high service quality guarantee.

Testing that link performance complies with a Service Level Agreement (SLA) includes verifying Frame Transfer Delay (FTD), Frame Delay Variation (FDV) and Frame Loss Ratio (FLR) at the Committed Information Rate (CIR) defined in the SLA. Verifying the SLA with the Valkyrie1564 allows doing the test on a line simultaneously loaded with traffic from other services.

Valkyrie is used for benchmarking in accordance with:

- RFC2544
- RFC2889
- RFC3918
- Vsperf
- Y.1564

WHITE PAPERS _____

| Latency & Jitter | Application Emulation | Time Synchronization | Quality of Service | SD-WAN |

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Security

Security testing is usually conducted during development to reveal how a DUT handles abnormal conditions.

- Traffic that mimics various types of DDoS attacks
- Very high traffic loads
- Undersized and oversized frames
- Non-standard Inter-Frame-Gaps

- Deviation of the Ethernet signal frequency
- Insertion of L2/3 packet level errors
- Insertion of PCS Layer Errors
- Emulation of fragment Overlap

Convergence

Many network topologies provide resiliency to protect network services. Resilience typically means re-routing traffic away from a faulty line section. However re-routing connections can result in frame loss. This is defined in standards for spanning and routing protocols, such as G.8031/G.8032, MPLS protocols and others.

When traffic with a given transmitted frame rate is sent through the connection during re-routing, ValkyrieManager can measure the packet loss and calculate the convergence time.

- ValkyrieManager does link sync gap monitoring and measurement with microsecond precision

HARDWARE

Different chassis and test modules options to fit all needs.

WRITE YOUR TITLE

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ValkyrieBay

Physical Specifications

High port density: 12 slots in a 4U high chassis

Multi-user: one user per port

6.7" (H) x 17" (W) x 17.9" (D) (17 x 43.5 x 45cm)

35 lbs (16 kg) with no test modules installed

Low noise: Max. 58.5 dBa

Extreme Performance

Reach 2.4 terabit test fabric in just one
ValkyrieBay Chassis with:

6 x Thor-400G-7S-1P test modules or
12 x Loki-100G-5S-2P test modules.

ValkyrieBay Comparison

	Val-C12-720G	Val-C12-2400G
400GE	N/A	6 x (QSFP-DD) LR4/SR4/CR4
200GE	N/A	12 x (QSFP56) DR4/SR4/FR4/LR4/CWDM4/CR4 (6 CR8)
100GE	12 x LR4/SR4/CDWM4 /CR4	24 x LR4/SR4/CDWM4 /CR4/SR2/CR2/DR (8 x SR10)
50GE	24 x LR2/SR2/CR2	48 x LR2/SR2/CR2
40GE	12 x QSFP+ (or 6 x LR4 / 12 x SR4)	24 x LR4/SR4/CR4
25GE	48 x LR/SR/CR	96 x LR/SR/CR
10GE	72 x copper ports	96 x optical ports, 72 copper ports
5GE	72 x copper ports	72 x copper ports
2.5GE	72 x copper ports	72 x copper ports
1GE	72 x copper/optical ports	72 x copper/optical ports

ValkyrieCompact

Physical Specifications

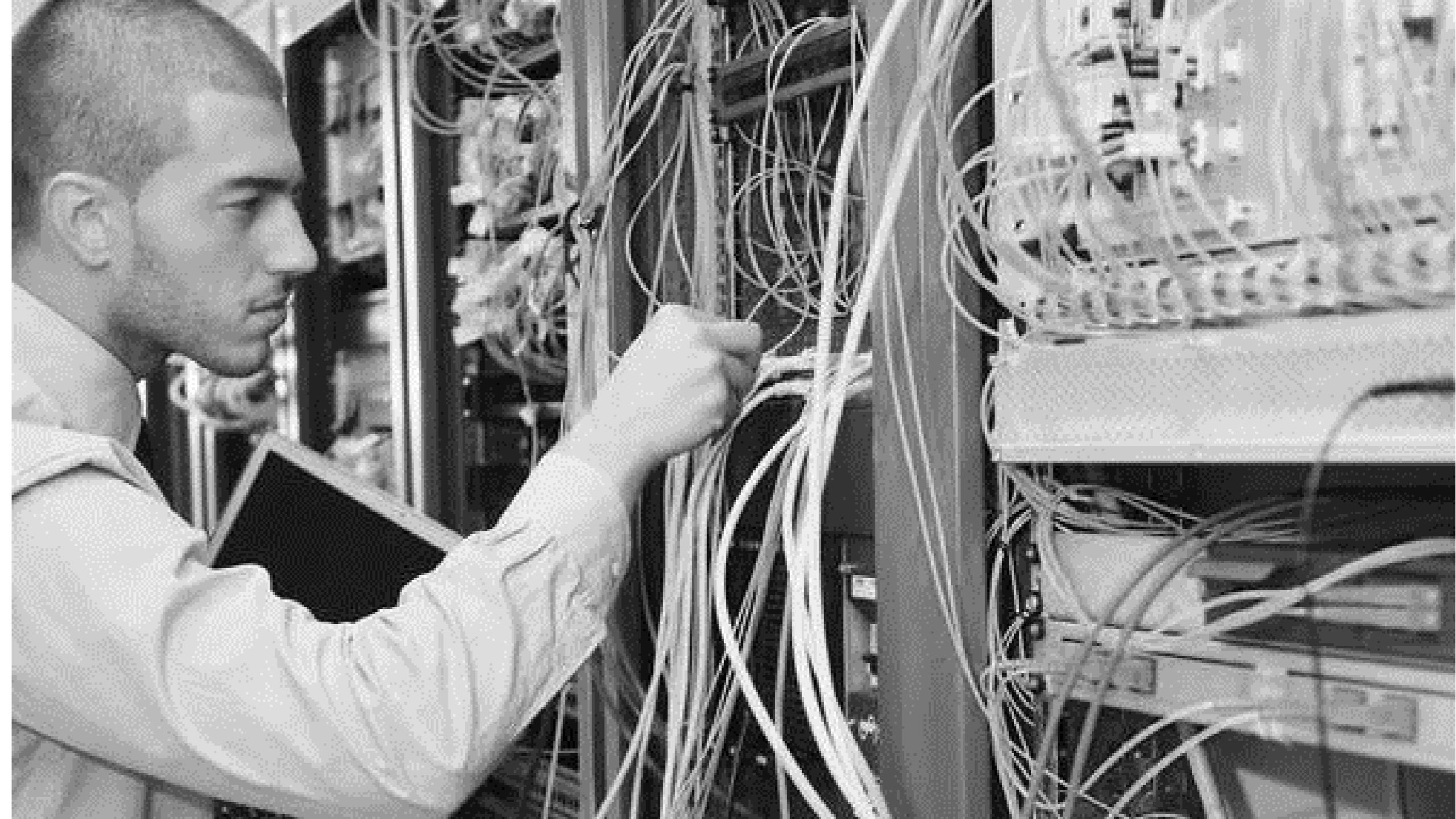Supports all Xena test modules

Multi-user: one user per port

1 slot and 1 rack unit (RU) high

1.7" (H) x 17" (W) x 9.8"(D) (5 x 43.5 x 25cm)

10 lbs (4.5 kg)

Low noise: Max. 49 dBa

Lightweight flightcase available

Valkyrie Test Modules

Specifications

13 different test modules

Support for all Ethernet speeds and interfaces

Unique multi-speed / media capabilities

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Valkyrie Test Module Speeds

	<1GE	1GE	2.5GE	5GE	10GE	25GE	40GE	50GE	100GE	200GE	400GE
ODIN-1G-3S-6P	✓	✓									
ODIN-1G-3S-6P-E	✓	✓									
ODIN-5G-4S-6P-CU	✓	✓	✓	✓							
ODIN-10G-1S-2P					✓						
ODIN-10G-1S-6P					✓						
ODIN-10G-3S-6P-CU	✓	✓			✓						
ODIN-10G-5S-6P-CU	✓	✓	✓	✓	✓						
C-ODIN-10G-4S-2P-COMBI*	✓	✓			✓						
ODIN-40G-2S-2P					✓		✓				
LOKI-100G-3S-1P					✓		✓		✓		
LOKI-100G-5S-1P					✓	✓	✓	✓	✓		
LOKI-100G-5S-2P					✓	✓	✓	✓	✓		
THOR-400G-7S-1P					✓	✓	✓	✓	✓	✓	✓

*Exclusively available in the ValkyrieCompact chassis

SOFTWARE

We work hard to make sure your job easy. All our software is designed to be intuitive and user-friendly.

User Friendly UI

1. Easy to use "tree" structure for managing test bed of chassis, modules and ports.

2. Top ribbon provides instant access to commonly used functions.

3. Color-coding and tool tips are included to make user-interface very intuitive.

4. Graphical elements help testers quickly scan results. Panels can also be dragged free of main UI for testing convenience.

5. Convenient reporting options make it easy to export and document results.
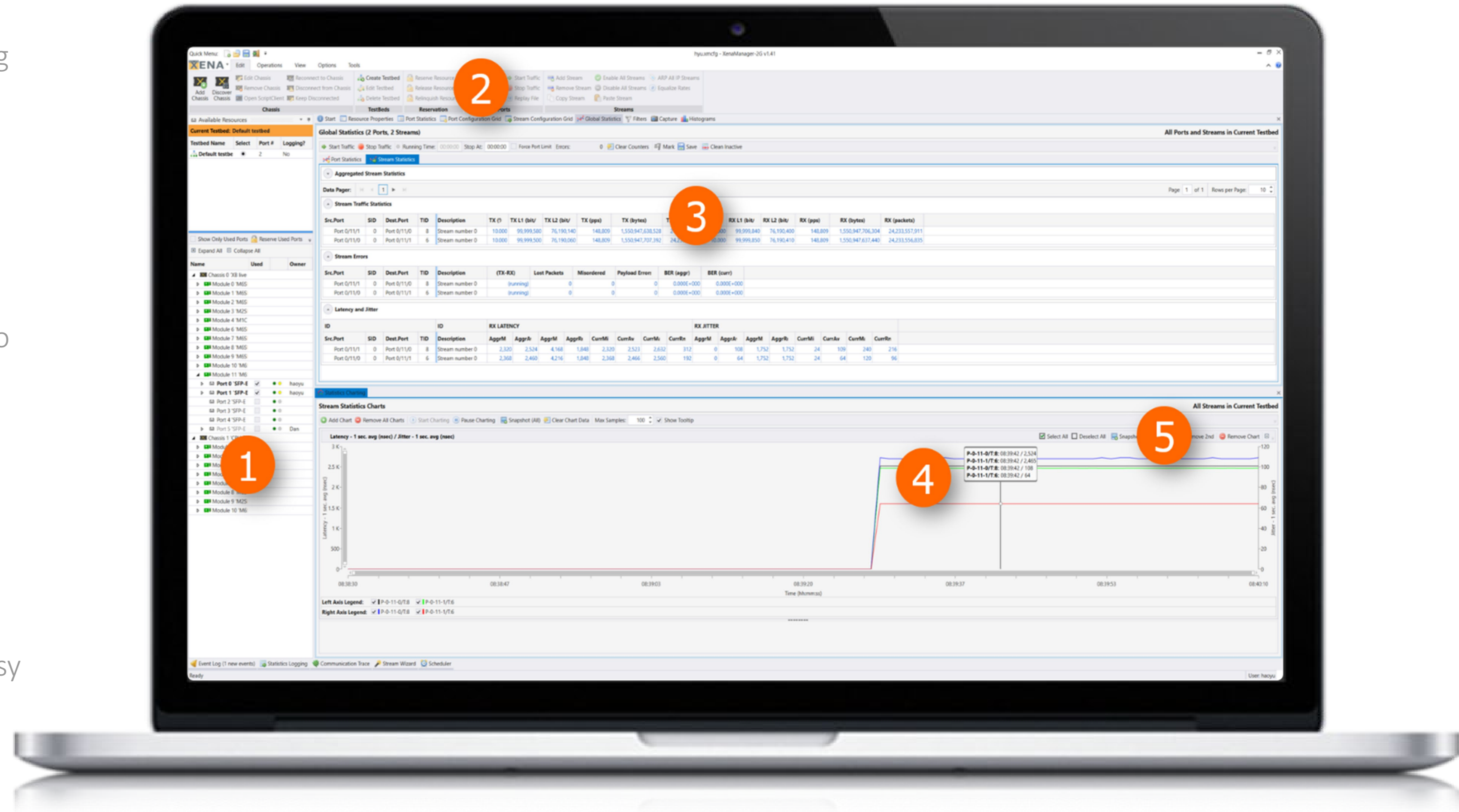
ValkyrieManager

- The main software of the Valkyrie line, it's the one you'll use most of the time

- Windows-based application to configure and generate streams of Ethernet traffic between your Valkyrie tester and devices under test (DUTs) and then analyze the results.

- Included for free with every Valkyrie system. Latest version can always be downloaded here

Valkyrie Test Suites

VALKYRIE 2544

Supports the 4 test-types specified in RFC2544. There are extensive configuration options, support for single stream and multi-stream testing and you can define protocol layers supported by the test (Ethernet, Customer and Service VLANs, IP and UDP) precisely the way you want.

VALKYRIE™ 2889

For accurately benchmarking the performance of Layer 2 LAN switches according to RFC 2889 tests. Incl. all throughput and forwarding rate tests, congestion control, address caching capacity, address learning rate, broadcast frame forwarding and latency, forward pressure and max. forwarding rate.

VALKYRIE 1564

For validating Ethernet service-level agreements (SLAs) in a single test per Y.1564. It supports multiple protocols per UNI (Ethernet, Customer and Service VLANs, MPLS, IPv4, IPv6, and UDP) and you can define Per-UNI or per-CoS bandwidth profiles and specify CoS-to-DSCP mapping.
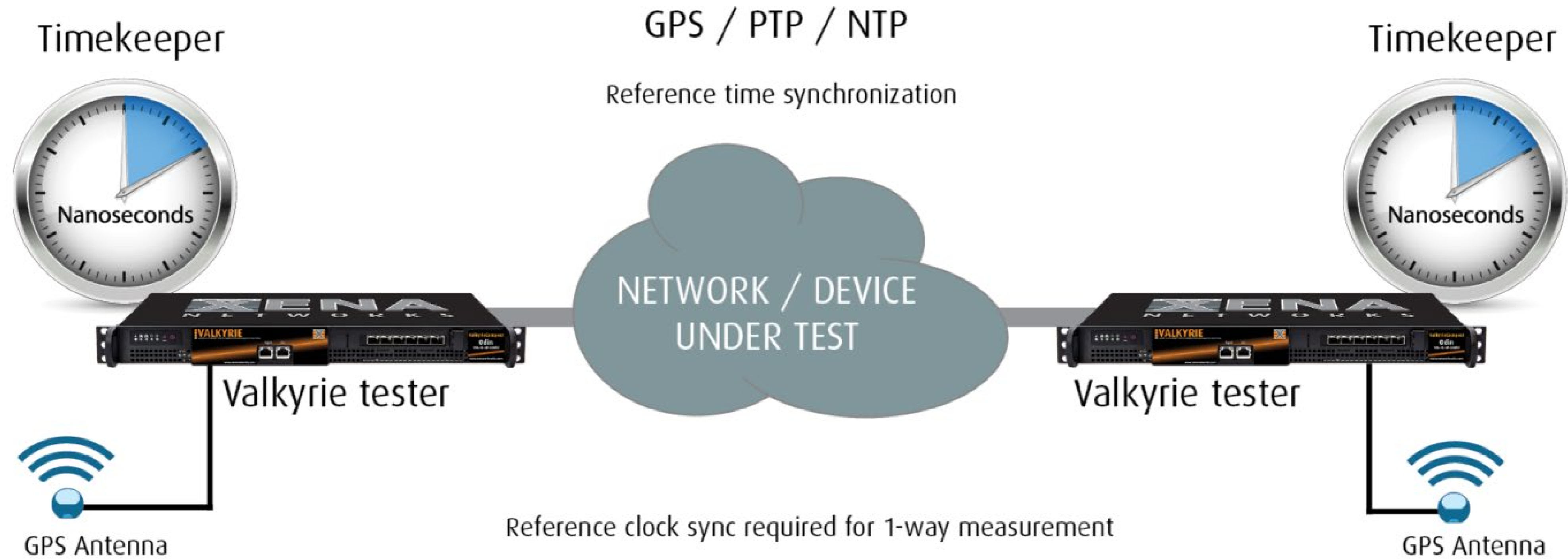
VALKYRIE™ 3918

For advanced IP multicast network testing using various frame sizes, either as in-test variations or as multiple test runs each using a fixed frame size. Unicast and multicast traffic can be configured to use the exact protocol headers needed.

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ValkyrieTimeSynch

For One-Way Latency (OWL) measurements, synchronized traffic start and accurate timestamping.

Timekeeper

Nanoseconds

GPS / PTP / NTP

Reference time synchronization

NETWORK / DEVICE UNDER TEST

Timekeeper

Nanoseconds

Valkyrie tester

Valkyrie tester

GPS Antenna

GPS Antenna

Reference clock sync required for 1-way measurement

AUTOMATION

Valkyrie boasts the best test automation & scripting options

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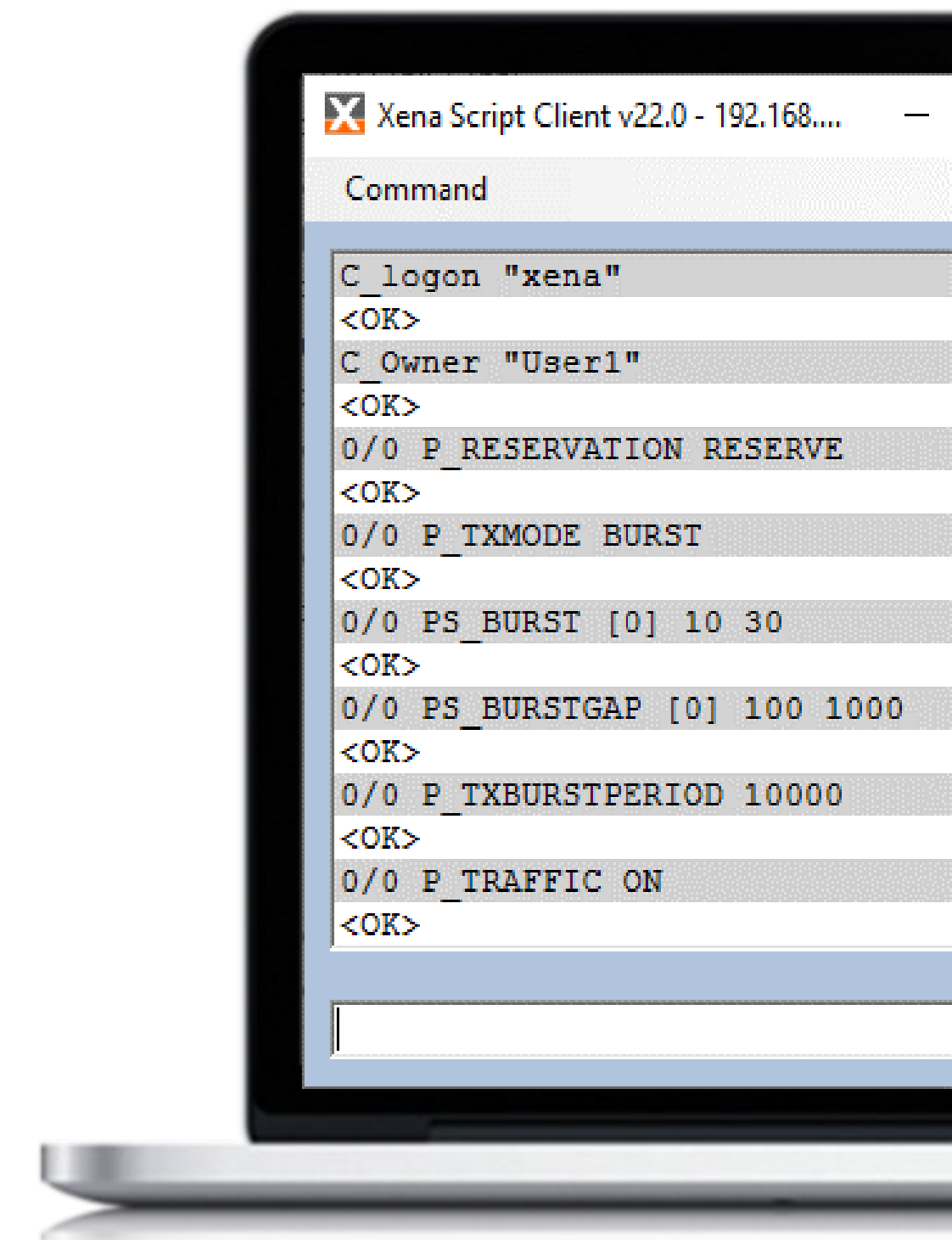
ValkyrieCLI

- The best test automation tool in the industry

- ValkyrieCLI supports multiple concurrent scripting sessions by different users in different locations.

- ValkyrieCLI is a command-line-interface (CLI) scripting API with hundreds of scriptable parameters. Any client platform can be used (e.g. Python, Tcl, Bash). View samples on GitHub

python   Tcl   BASH
THE BOURNE-AGAIN SHELL

Xena Script Client v22.0 - 192.168....   —

Command

```
C_logon "xena"
<OK>
C_Owner "User1"
<OK>
0/0 P_RESERVATION RESERVE
<OK>
0/0 P_TXMODE BURST
<OK>
0/0 PS_BURST [0] 10 30
<OK>
0/0 PS_BURSTGAP [0] 100 1000
<OK>
0/0 P_TXBURSTPERIOD 10000
<OK>
0/0 P_TRAFFIC ON
<OK>
```

Valkyrie REST API

Top features

Client-less, language-agnostic, out-of-the-box, chassis embedded REST server.

Lets you build automation scripts with your choice of language, tool and client environment.

Supports all Valkyrie CLI commands and adds many more abstract operations (like returning statistics as ready-to-consume JSON) that simplify and speed up automation development.
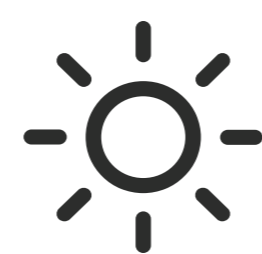
Full Python object-oriented REST client

Enables Python developers to simply pip install it and start building automation scripts without spending time on developing the traffic generator layer.

More information:

How to build client apps using Valkyrie REST Server

SOFTWARE

Xena Automation Resources

DOCUMENTATION

Step-by-step guides on how to automate Xena test suites and explore scripting for stateless platforms.

DRIVERS & SCRIPTS

Find and download drivers and scripting examples in scripting languages.

PLATFORMS

Learn about commercial and open source platforms and frameworks that support Xena's Ethernet test solutions.

PROJECTS

Read about Xena's work with Open Platform for NFV (OPNFV) community on the vSwitch Performance (VSPerf) project.
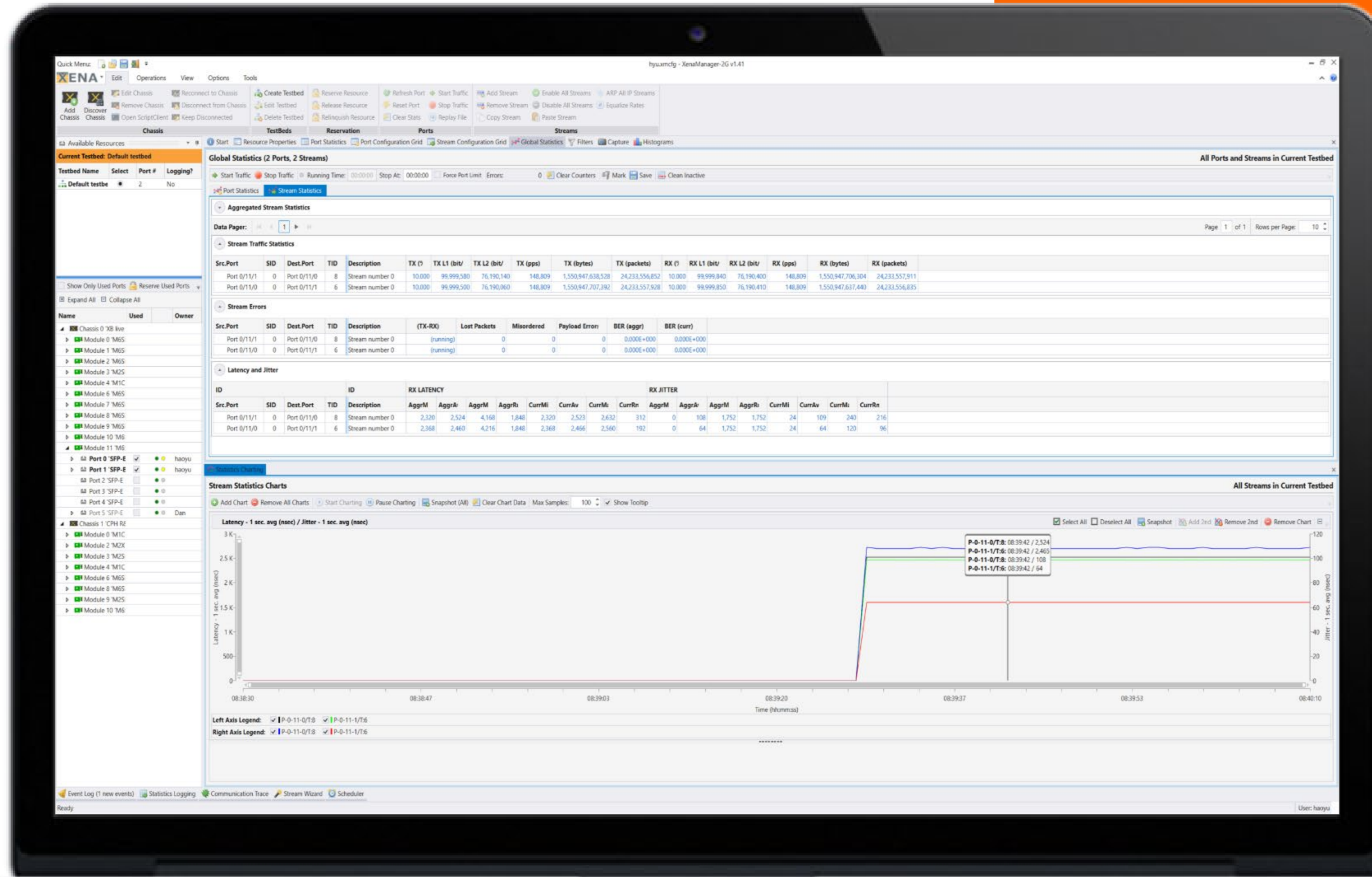
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Key Features

These are Valkyrie's most powerful technical features.
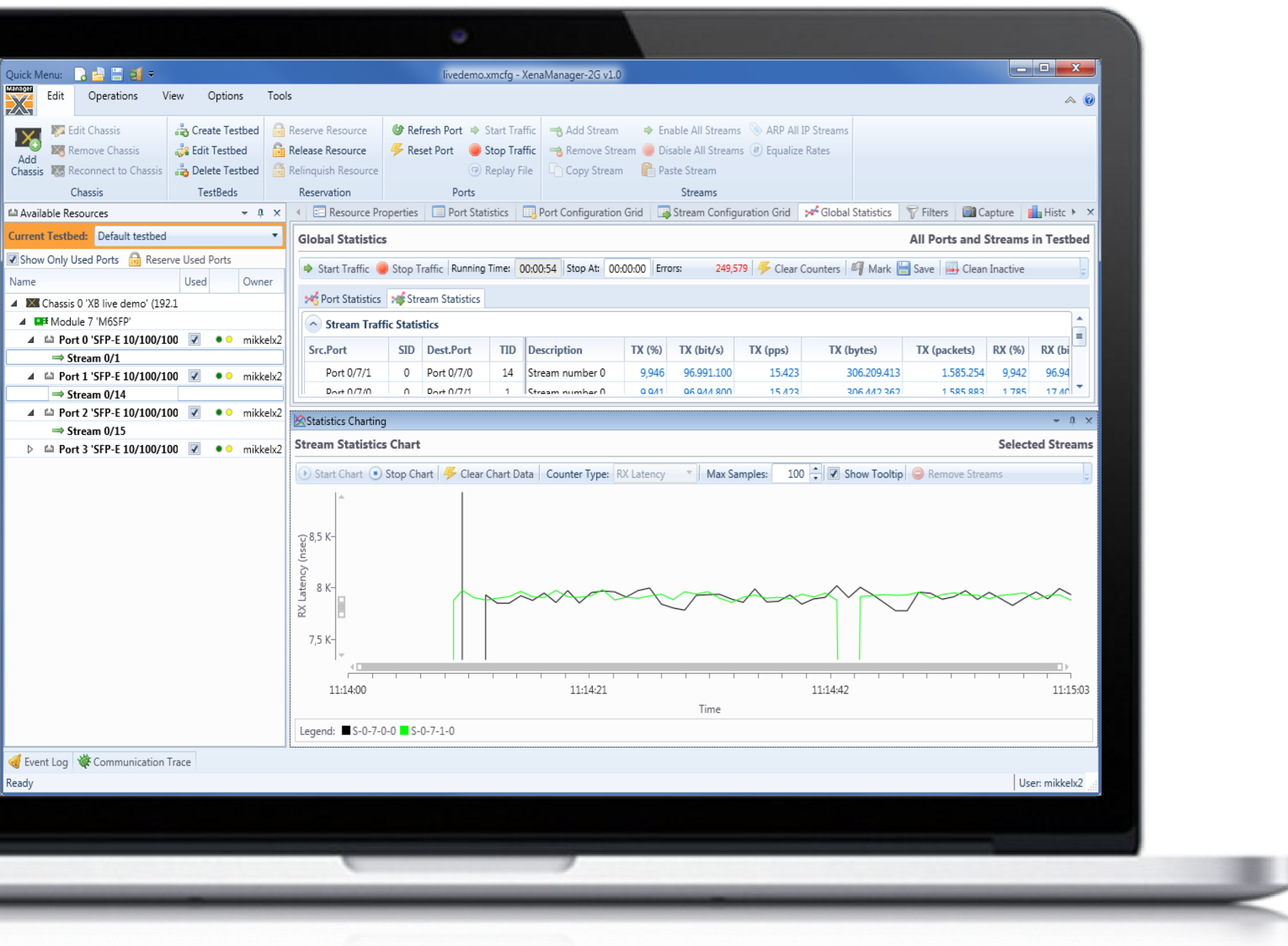
6

User Friendly and intuitive UI

Statistics Charting, Reporting and Logging

- Real-time charts of monitored parameters. Displays multiple charts at once

- Choose two different parameters where each parameter is associated with its own Y-axis

- Periodically poll counters for all ports in a testbed and log to a CSV or XML file

- Generate reports as PDF or HTML files of counters for all ports in a testbed

Same CLI commands across all port speeds
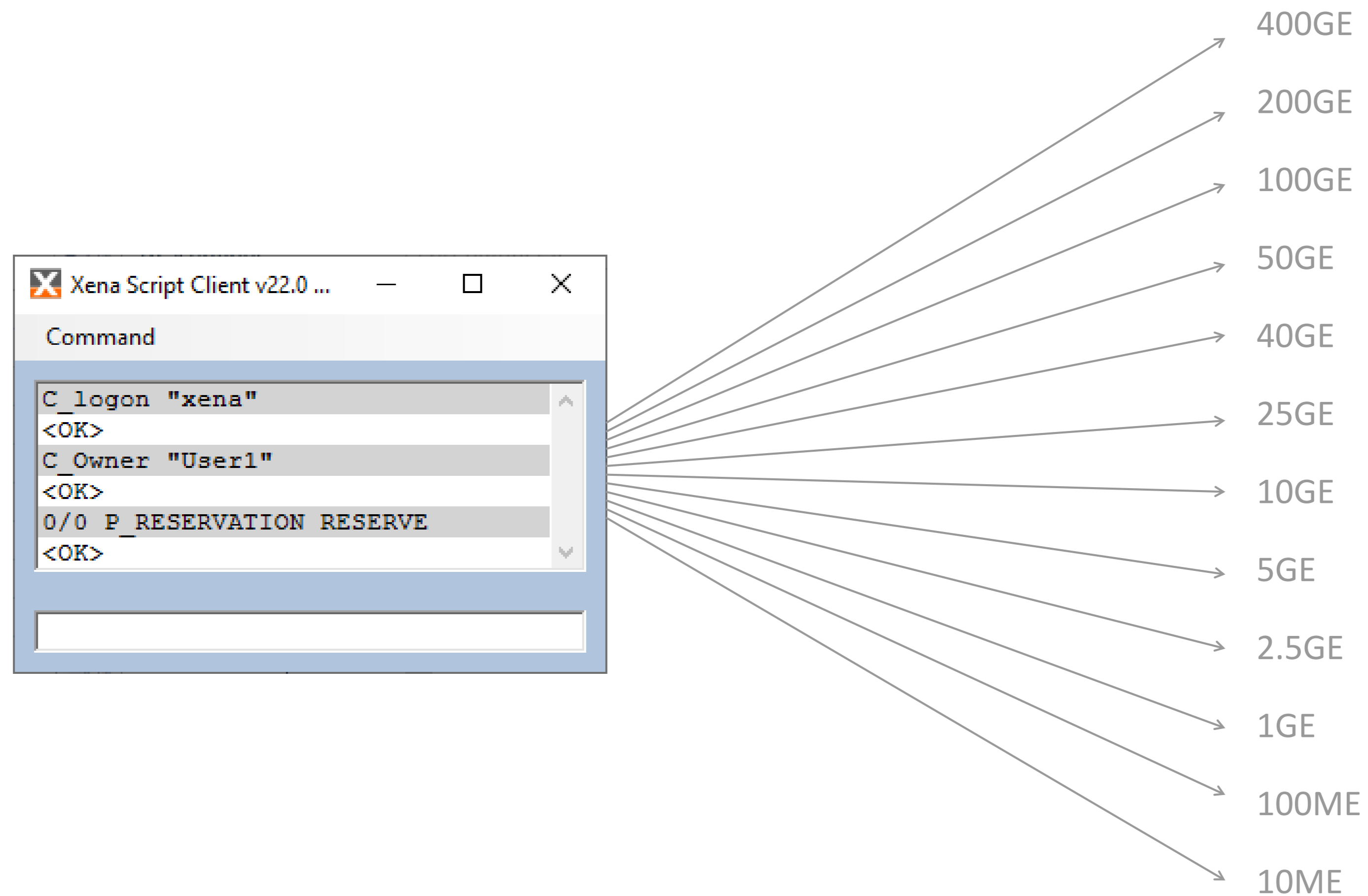
Precise and accurate traffic generation (1/2)

- Stream-oriented Traffic Generation: Generate hundreds of unique transmit and receive traffic "streams"

- Each stream can generate 100k's of unique traffic "flows" using programmable packet field modifiers to increment or randomize field values such as MAC addresses, IP addresses, and VLAN identifiers

- Stream rates can be defined as a percentage of line rate, frames per second, or bit-rate

- Packet injection can be controlled as a single-packet shot, number of packets, time duration, or in continuous mode

- Traffic profiles can be defined as uniform or bursty

- Custom packet editing (via a graphical editor) lets you build any packet format via predefined packet templates for Ethernet, Ethernet II, VLAN, ARP, IPv4, IPv6, UDP, TCP, LLC, SNAP, GTP, ICMP, RTP, RTCP, STP, SCTP, MPLS, PBB, FCoE, IGMPv2/3, or fully specified by user.

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Precise and accurate traffic generation (2/2)

- Real-time Analysis and Reporting

- Packet flow statistics are tracked per stream, or per-user defined filters which can include any combination of programmable field values. Incoming packet streams are automatically identified using optionally auto-inserted Test Payload fields.

- Analysis of traffic throughput, latency, jitter, loss, sequence, and misorder errors is performed real-time per received stream with 16/32 ns accuracy depending on the interface type (optical/electrical).

- Users can capture packets at wire speed on each port for detailed analysis and hot-button export packet analysis tool WireShark, which in conjunction with event triggering and programmable filters provides a unique ability to identify and isolate performance issues.
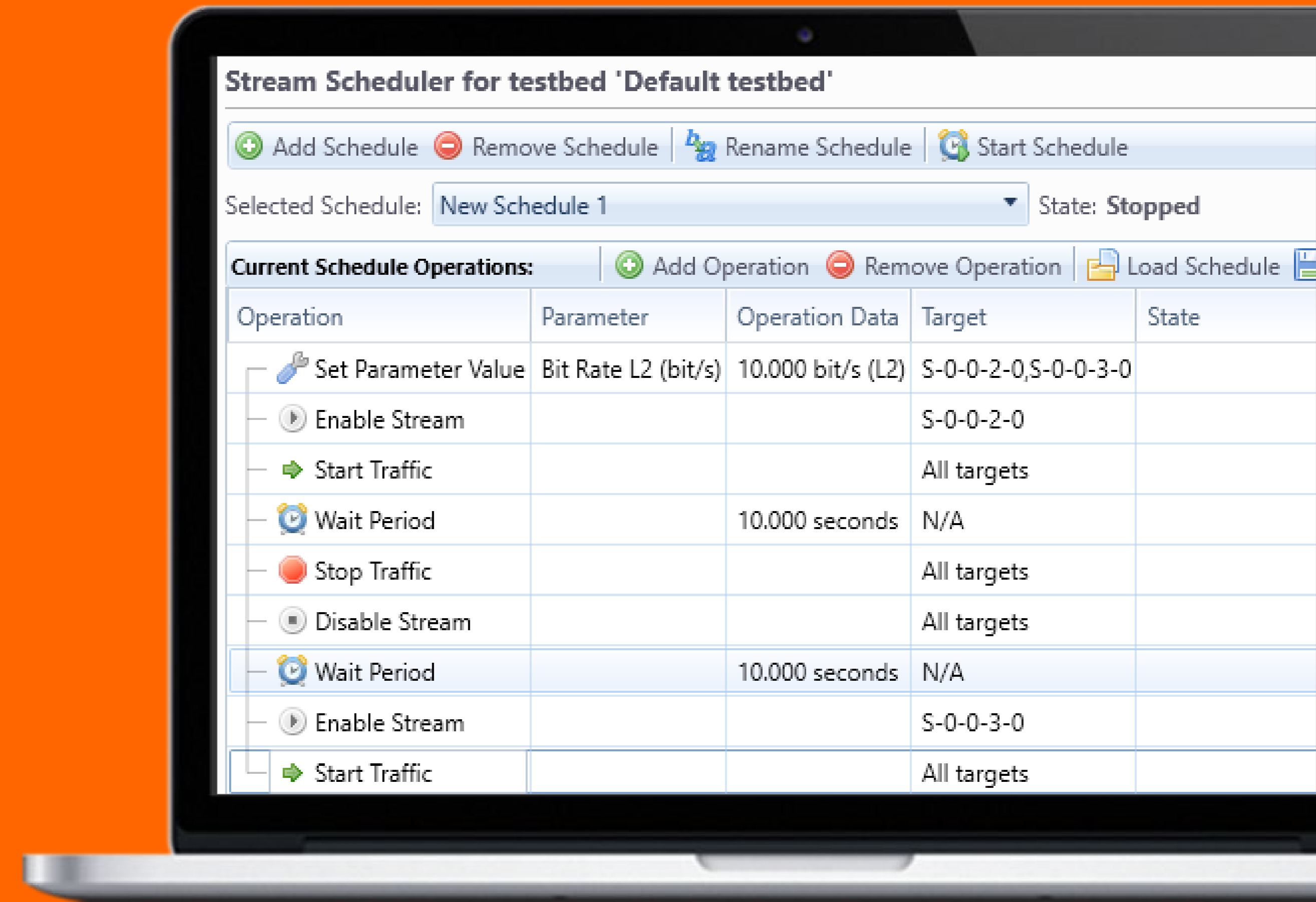
Industry's best traffic scheduler

ValkyrieManager supports scheduling – a sequence of operations activated with a single mouse click – to make testing easier.

Stream Scheduler can be used to start-and-stop traffic, change packet rate, change operations orders, add loop section, etc.

Industry's only UI integrated Traffic Generation & Impairment solution (Valkyrie & Chimera)

Chimera is Xena's network impairment emulator - it lets you introduce consistent, accurate, well-defined and repeatable impairments to traffic between DUTs in the lab.

Valkyrie Traffic Generator modules generate test traffic to pass through the DUTs

Chimera and Valkyrie modules can be installed in the same chassis

Chimera and Valkyrie Traffic Generator

Ethernet signal

Ethernet signal

DUT

DUT
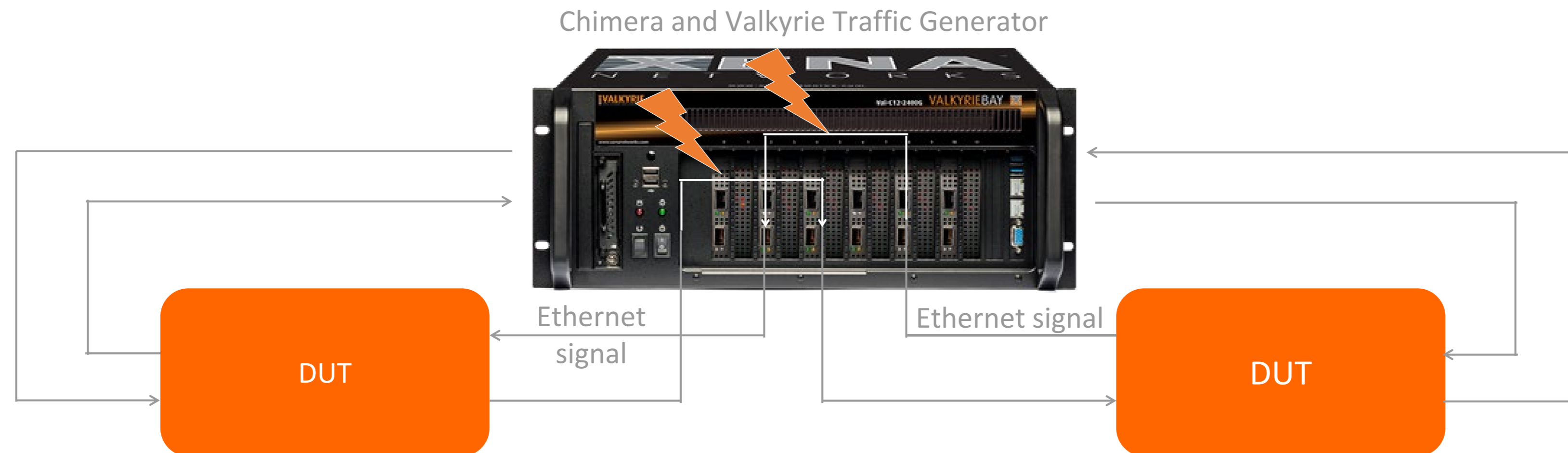
Thor-400G-7S-1P tests both PAM4 and NRZ speeds

Upgrading to the new PAM4 (50/100/200/400GE) speeds from the NRZ (10/40/100GE) speeds means testing equipment and services using both NRZ and PAM4-based traffic generators.
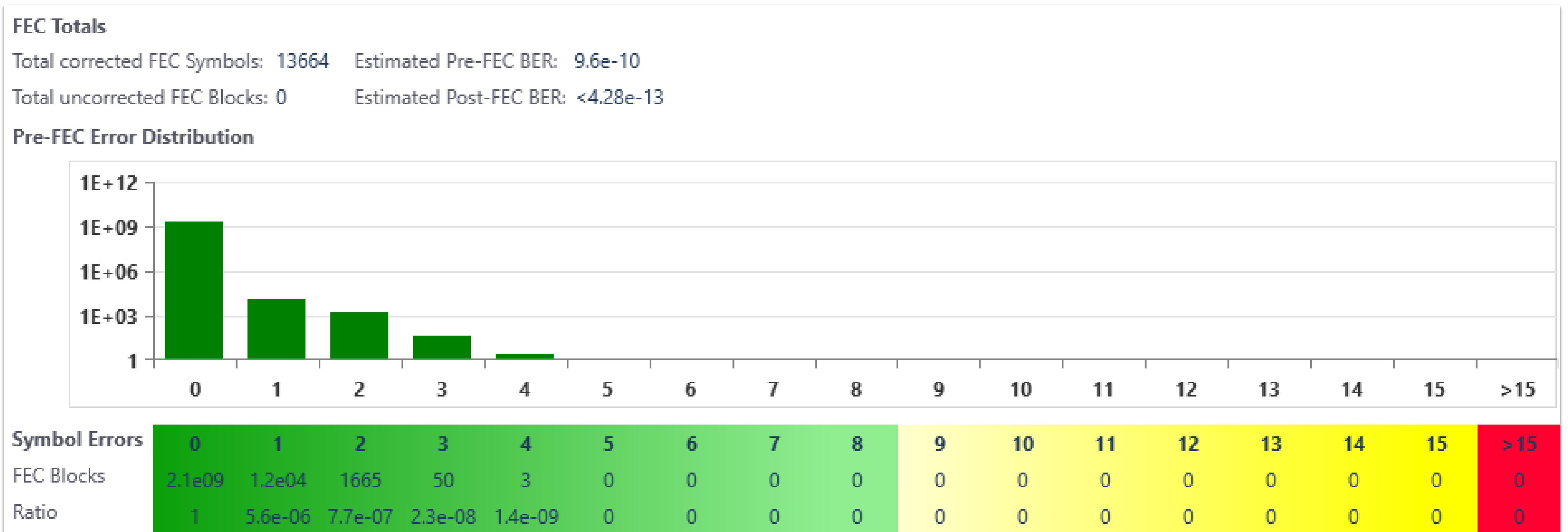
Xena is the ONLY vendor on the market that lets you do that with just 1 test module – Thor-400G-7S-1P.

PAM4

| 50GE | 100GE | 200GE | 400GE |

NRZ

| 10GE | 25GE | 40GE | 50GE | 100GE |

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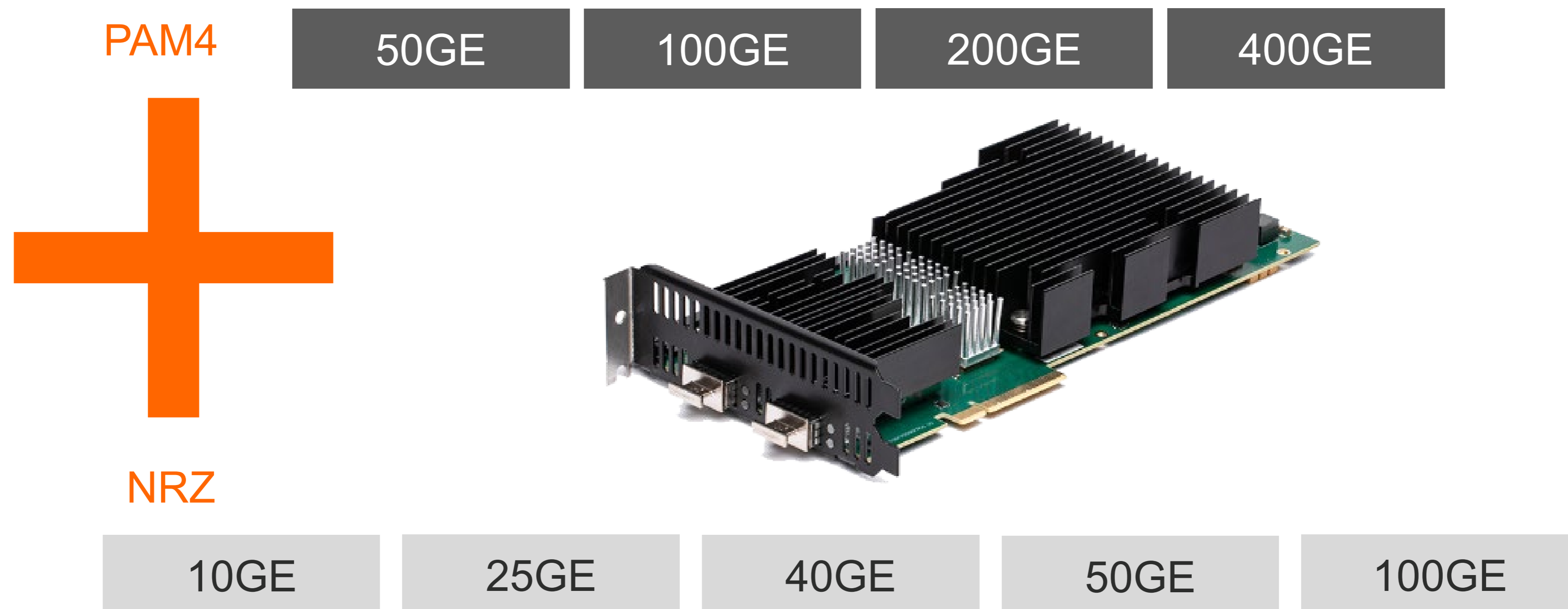
Advanced FEC stats for PAM4

When using Thor-400G-7S-1P, ValkyrieManager also provides easy access to advanced FEC stats:

- Pre/Post FEC statistics

- Pre-FEC Error Distribution graph:

FEC Totals

Total corrected FEC Symbols: 13664   Estimated Pre-FEC BER: 9.6e-10

Total uncorrected FEC Blocks: 0   Estimated Post-FEC BER: <4.28e-13

Pre-FEC Error Distribution

Symbol Errors	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15
FEC Blocks	2.1e09	1.2e04	1665	50	3	0	0	0	0	0	0	0	0	0	0	0	0
Ratio	1	5.6e-06	7.7e-07	2.3e-08	1.4e-09	0	0	0	0	0	0	0	0	0	0	0	0

Valkyrie – making test engineers lives easier for over a decade ☺

- ✓ ValkyrieManager is a richly-featured and easy-to-use UI ("2-clicks" to get a stream running)

- ✓ Same CLI commands across all port speeds

- ✓ Very precise and accurate traffic generation

- ✓ Industry's best traffic scheduler

- ✓ Industry's only UI integrated Traffic Generation & Impairment solution (Valkyrie & Chimera)

- ✓ Robust chassis platform (Linux), runs "forever", supporting +40-day test cases

- ✓ Smooth and fast chassis software upgrade processes

- ✓ Compact ValkyrieCompact 1U chassis covers 1, 2.5, 5, 10, 25, 40, 50, 100, 200, 400GE speeds

- ✓ Multi-user platform with port reservation resolution down to one port per user

- ✓ Thor-400G-7S-1P supports both four PAM 4 based speeds (50, 100, 200 and 400GE) and five NRZ based speeds (10, 25, 40, 50 and 100GE) in one test module

- ✓ Advanced FEC stats for PAM4

Test. Improve. Repeat.

THANK YOU

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in linkedin.com/company/xena-networks

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Want more?

CHECK TECHNICAL DOCUMENTATION

SEE PRICING EXAMPLES

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BOOK A GUIDED SW TOUR