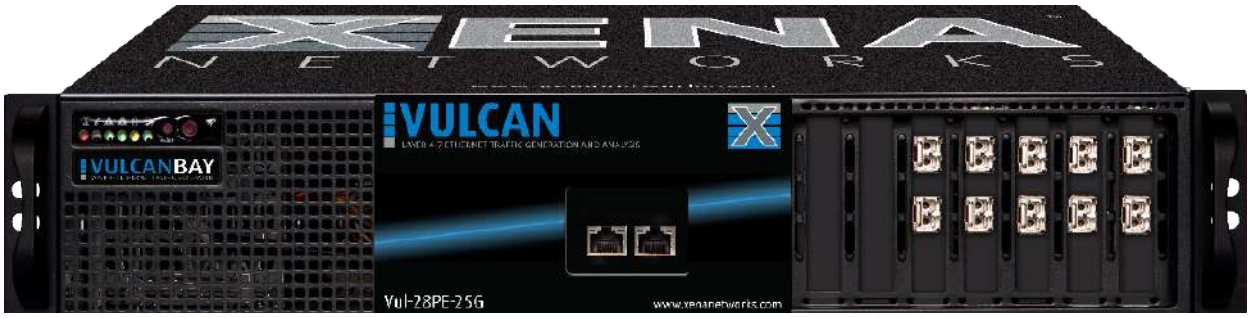
VulcanBay

High Performance Stateful Traffic Generator and Analyzer



VulcanBay is a stateful traffic generator for load testing, analysis and characterizing of Ethernet equipment and network infrastructure. It supports 1/2.5/5/10/25/40GE interfaces and can be used for simulating millions of real-world end-user environments to test and validate a single device, or an entire system.

VulcanBay offers stateful end-to-end testing of network appliances such as switches, firewalls, routers, NAT routers, proxies, bandwidth shapers, and more. The platform is also suitable to characterize entire network infrastructure performance.

Developers of Ethernet-based network appliances can characterize their performance by measuring connection establishment and teardown rates, packet forwarding rate at large numbers of connections and identify performance bottlenecks. The platform is also ideal for rapid validation of performance or regression testing.

Developers of stateful network security devices such as next-generation firewalls (NGFW) can measure TLS handshake rate, TLS throughput, TCP CC/CPS, and HTTP CPS/TPS. Users can also replay their own PCAP files to the DUT for performance verification.

VulcanManager is included for ad-hoc test execution and remote management of test equipment located in multiple locations. VulcanAppMix helps to test with real-world applications and protocols for highly scalable application emulation.

Flexible Upgrade Path

VulcanBay can be easily upgraded for greater performance thanks to Xena's flexible licensing model which lets you easily upgrade VulcanBay by simply updating your license. This helps you protect your investment by spreading out capital expenditure across multiple quarters, and optimize your budget by purchasing additional performance when required.

High Performance:

- 28 million Concurrent Connections (CC)*
- 6 million Connections Per Second (CPS)**
- 1 million Concurrent TLS Sessions
- 6 million Transactions Per Second, 7 million HTTP Transactions Per Second (TPS)***
- Capture capacity: 40 million x 128 bytes buffers / 4 million full-size buffers

* *28M TCP Clients and 28M TCP Servers on one VulcanBay*
** *Measured at 1M CC per 10G port*
*** *Measured at 10 transactions per connection*

Features and Benefits

- Stateful TCP traffic load generation with extreme performance – 28 million TCP connections *
- High throughput of TLS encrypted traffic
- Scalable performance via license upgrade
- Supports 1/2.5/5/10/25/40GE optical or copper Ethernet interfaces for L4-7
- Configuration and tuning of Ethernet, IP and TCP header fields for advanced traffic scenarios
- Extensive live stats and test reports
- Wire-speed traffic capture with up to 4 million packets capacity
- Switched and routed network topologies, TCP proxy and NAT support
- Free traffic generation and analysis software included (VulcanManager)
- Scalable application emulation for performance testing with real-world protocols, applications, and traffic mixes from VulcanAppMix

PRODUCT NUMBER	DESCRIPTION
Vul-28PE-10G-CU	 H: 3.5″ (9.1 cm) W: 19″ (43.7 cm) Slot #: 0 1 2 3 4 5 1G 1G 1G 1G 1G 1G 2.5G 2.5G 2.5G 2.5G 2.5G 2.5G 5G 5G 5G 5G 5G 5G 10G 10G 10G 10G 10G 10G **VulcanBay 6-slot chassis (non-modular), 28 packet engines, unit controller, AC power, excl. tvcrs** • Slots 0 TO 5: Test Ports 2 x RJ45, 2 x 4-speed 10000/5000/2500/1000 BASE-T (requires 2 x Vul-V1G-P / Vul-V10G-P licenses)
Vul-28PE-25G	 H: 3.5″ (9.1 cm) W: 19″ (43.7 cm) Slot #: 0 1 2 3 4 5 1G 1G 1G 1G 1G 1G 10G 10G 10G 10G 10G 10G 25G 25G 25G 25G 25G 25G **VulcanBay 6-slot chassis (non-modular), unit controller, AC power, excl. tvcrs** • Slot 0 to 5: Test Ports 2 x SFP28, 2 x 3-speed 25GBASE-SR/LR/DAC (requires 2 x Vul-V1G-P / Vul-V10G-P / Vul-V25G-P licenses)
Vul-28PE-40G	 H: 3.5″ (9.1 cm) W: 19″ (43.7 cm) Slot #: 0 1 2 3 4 5 1G 1G 40G 1G 1G 40G 10G 10G 10G 10G 25G 25G 25G 25G **VulcanBay 6-slot chassis (non-modular), unit controller, AC power, excl. tvcrs** • Slot 0: Test Ports 2 x SFP28, 2 x 3-speed 25GBASE-SR/LR/DAC (requires 2 x Vul-V1G-P / Vul-V10G-P / Vul-V25G-P licenses) • Slot 1: Test Ports 2 x SFP28, 2 x 3-speed 25GBASE-SR/LR/DAC (requires 2 x Vul-V1G-P / Vul-V10G-P / Vul-V25G-P licenses) • Slot 2: Test Port 1 x QSFP+, 1 x 1-speed 40GBASE-SR4/LR4/DAC (requires 1 x Vul-V40G-P license) • Slot 3: Test Ports 2 x SFP28, 2 x 3-speed 25GBASE-SR/LR/DAC (requires 2 x Vul-V1G-P / Vul-V10G-P / Vul-V25G-P licenses) • Slot 4: Test Ports 2 x SFP28, 2 x 3-speed 25GBASE-SR/LR/DAC (requires 2 x Vul-V1G-P / Vul-V10G-P / Vul-V25G-P licenses) • Slot 5: Test Port 1 x QSFP+, 1 x 1-speed 40GBASE-SR4/LR4/DAC (requires 1 x Vul-V40G-P license)
Vul-28PE-25G-10G-CU	 H: 3.5″ (9.1 cm) W: 19″ (43.7 cm) Slot #: 0 1 2 3 4 5 1G 1G 1G 1G 1G 1G 2.5G 10G 2.5G 10G 2.5G 10G 5G 25G 5G 25G 5G 25G 10G 10G **VulcanBay 6-slot chassis (non-modular), unit controller, AC power, excl. tvcrs** • Equipped with 6 x RJ45 1000/2500/5000/10000 BaseT ports, 6 x 25GBASE-SR4/LR4 SFP28 ports, and 28 Packet Engines • Requires Vul-V1G-P, Vul-V10G-P or Vul-V25G-P speed licenses

PORT LICENSES (Required to enable port)	
Vul-V1G-P	Perpetual license to enable 1 x Test Port to operate at 1GE (port must support the speed)
Vul-V10G-P	Perpetual license to enable 1 x Test Port to operate at 1GE/2.5GE/5GE/10GE (port must support the speed)
Vul-V25G-P	Perpetual license to enable 1 x Test Port to operate at 1GE/2.5GE/5GE/10GE/25GE (port must support the speed)
Vul-V40G-P	Perpetual license to enable 1 x Test Port to operate at 1GE/2.5GE/5GE/10GE/25GE/40GE (port must support the speed)
FEATURE LICENSES (Required to enable features)	
Vul-Sec-P	Perpetual license to enable security features (TLS traffic generation) on the chassis
SUPPORTED TRANSCEIVERS	
• E10GSFPSR • E10GSFPLR • E40GQSFPSR • E25GSFP28SR	• Intel® Ethernet SFP+ SR Optic (1000BASE-SX 1G Ethernet & 10GBASE-SR 10G Ethernet) • Intel® Ethernet SFP+ LR Optic (1000BASE-LX 1G Ethernet & 10GBASE-LR 10G Ethernet) • Intel® Ethernet QSFP+ (40GBASE-SR4 - 4x10GbE and 1x40GbE) • Intel® Ethernet SFP28 SR Optic (10G/25GBASE-SR)

Technical Specifications

	Vul-28PE-10G-CU	Vul-28PE-25G	Vul-28PE-40G
Port Speeds	12 x 1G/2.5G/5G/10G	12 x 1G/10G/25G	2 x 40G 8 x 1G/10G/25G
Port Speed Licenses Required	Vul-V1G-P Vul-V10G-P	Vul-V1G-P Vul-V10G-P Vul-V25G-P	Vul-V1G-P Vul-V10G-P Vul-V25G-P Vul-V40G-P
Packet Engines	28	28	28
NON-TLS PERFORMANCE & CAPACITIES PER CHASSIS			
UDP Concurrent Flows	28 million	28 million	28 million
UDP Flows per second	24 million/s (measured with 2 x 10G ports and 14 PEs per port)	24 million/s (measured with 2 x 25G ports and 14 PEs per port)	24 million/s (measured with 2 x 40G ports and 14 PEs per port)
TCP Concurrent Connections	28 million	28 million	28 million
TCP Connections per second	7 million/s (max) 3 million/s (sustained) (measured with 2 x 10G ports and 14 PEs per port, no TCP payload)	8.5 million/s (max) 3.5 million/s (sustained) (measured with 2 x 25G ports and 14 PEs per port, no TCP payload)	10 million/s (max) 4.5 million/s (sustained) (measured with 2 x 40G ports and 14 PEs per port, no TCP payload)
Transactions per second*	3.5 million/s (measured with 2 x 10G ports and 14 PEs per port)	4.5 million/s (measured with 2 x 25G ports and 14 PEs per port)	5.7 million/s (measured with 2 x 40G ports and 14 PEs per port)
Non-TLS Throughput**	120 Gbps (measured with 12 x 10G ports and 2 PEs per 10G port)	140 Gbps (measured with 4 x 25G and 4 x 10G ports, 5 PEs per 25G port, 2 PEs per 10G port)	140 Gbps (measured with 2 x 40G and 6 x 10G ports, 8 PEs per 40G port, 2 PEs per 10G port)
*measured at 10 transactions per connection **measured with Pattern bidirectional traffic scenario (1518-byte packet length)			
TLS PERFORMANCE & CAPACITIES PER CHASSIS			
Feature License Required	Vul-Sec-P	Vul-Sec-P	Vul-Sec-P
TLS Concurrent Connections	1 million	1 million	1 million
Transactions per second**	70,000/s (measured with 2 x 10G ports and 14 PEs per port)	70,000/s (measured with 2 x 25G ports and 14 PEs per port)	70,000/s (measured with 2 x 40G ports and 14 PEs per port)
TLS Throughput***	72 Gbps (measured at 12 x 10G ports and 2 PEs per 10G port)	64 Gbps (measured at 4 x 25G and 4 x 10G ports, 5 PEs per 25G port, 2 PEs per 10G port)	80 Gbps (measured with 2 x 40G and 6 x 10G ports, 8 PEs per 40G port, 2 PEs per 10G port)
*measured at TLS record size 8KB, 2KB key size, using (C0, 2F) ECDHE_RSA_WITH_AES_128_GCM_SHA256 **measured at 10 transactions per connection ***measured with Pattern bidirectional traffic scenario (1518-byte packet length, TLS record size 8KB, 2KB key size, using (C0, 2F) ECDHE_RSA_WITH_AES_128_GCM_SHA256)			
PACKET CAPTURE CAPABILITY			
Packet Capture per Chassis	40 million* 4 million**	40 million* 4 million**	40 million* 4 million**
*capture mode: small, 128 bytes kept per packet **capture mode: full, full-size packet			
REPLAY CAPABILITY			
PCAP Files	50 (per port) 300 (per chassis)	50 (per port) 300 (per chassis)	50 (per port) 250 (per chassis)
Replay Events*	2 million (per port) 12 million (per chassis)	2 million (per port) 12 million (per chassis)	2 million (per port) 10 million (per chassis)
one replay event is a TCP/UDP packet in the PCAP file			

Technical Specifications (port performance)

Port Speed	1G	2.5G	5G	10G	25G	40G
Port Non-TLS Throughput*	1 Gbps	2.5 Gbps	5 Gbps	10 Gbps	25 Gbps	40 Gbps
Minimum Number of PEs Required by Port	1	2	2	2	5	8
Port TLS Throughput**	1 Gbps	2.5 Gbps	5 Gbps	10 Gbps	25 Gbps	37 Gbps
Minimum Number of PEs Required by Port	1	4	4	4	10	14
*measured with Pattern scenario (1518-byte packet length, 1000 connections) **measured with Pattern scenario (1518-byte packet length, 1000 connections, TLS record size 8KB, 2KB key size, using (C0, 2F) ECDHE_RSA_WITH_AES_128_GCM_SHA256)						

Technical Specifications (cont'd)

Dimensions (H x W x D)	(2U) 3.5″ x 17.2″ x 17.7″ (89 mm x 437 mm x 450 mm)
Weight	42 lbs. (19.05 kg)
Input Voltage	100 – 240 VAC, 50 – 60 Hz
Power Supply	Two 800W AC power supplies. One power supply is redundant.
Operating Environment	5 °C – 35 °C
Non-Operating Environment	-40 °C – 70 °C
Operating Relative Humidity	8% – 90% (non-condensing)
Non-Operating Relative Humidity	5% – 95% (non-condensing)