



VULCAN

LAYER 4-7 ETHERNET TRAFFIC GENERATION AND ANALYSIS



ABOUT XENA

- XENA AND THE MARKET
- OUR TRACK RECORD
- APPLICATION OVERVIEW
- CUSTOMERS
- GLOBAL PRESENCE

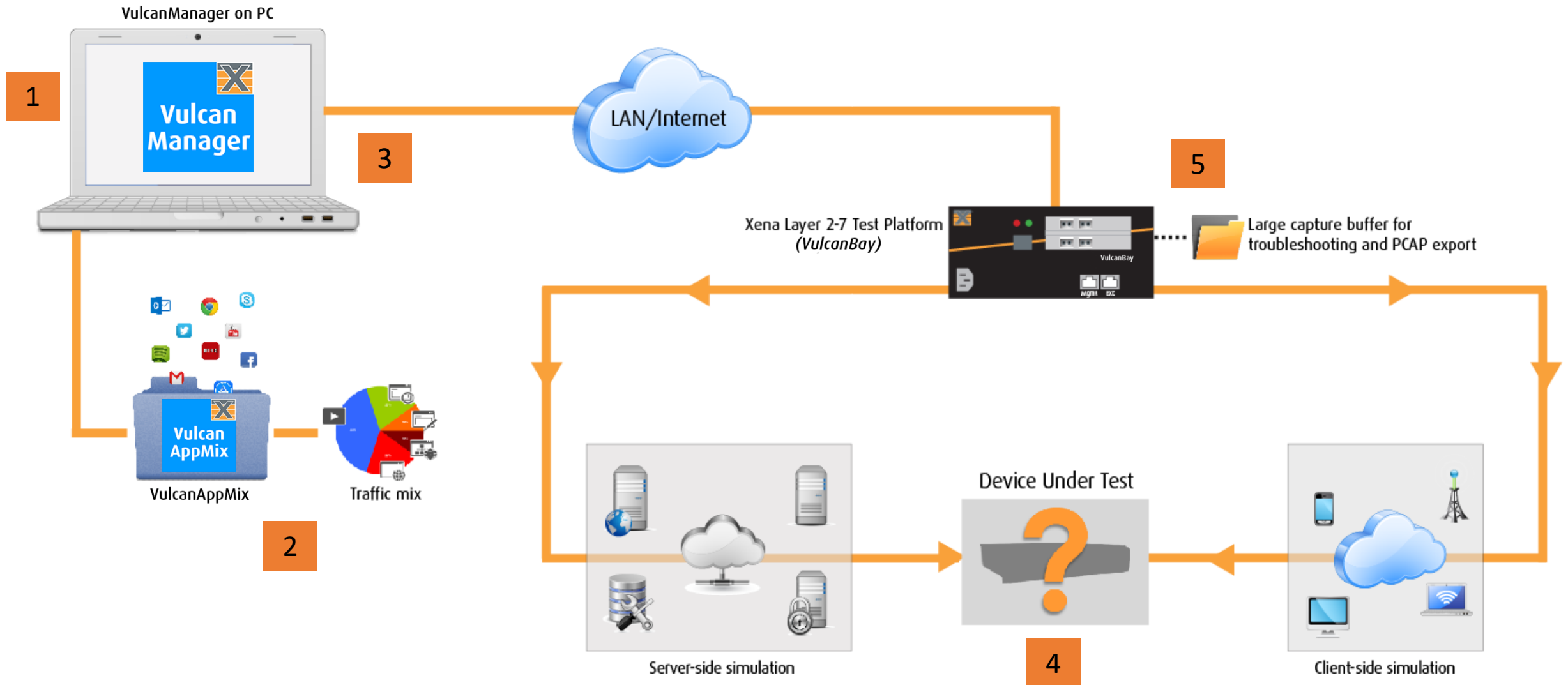
VALKYRIE LAYER 2-3

- HARDWARE
- SOFTWARE
- KEY FEATURES
- APPLICATIONS
- ROADMAP

VULCAN LAYER 4-7

- OVERVIEW
- HARDWARE
- SOFTWARE
- KEY FEATURES
- APPLICATIONS
- ROADMAP

OVERVIEW





Vulcan L4-7 Hardware

- VulcanBay Chassis
- Licensing

HARDWARE – VulcanBay extreme performance chassis



- 28 million Concurrent Connections (CC)*
- 6 million Connections Per Second (CPS)**
- 1.4 million Concurrent TLS Sessions, 14,000 TLS Sessions Per Second
- 6 million HTTP Connections Per Second, 7 million HTTP Transactions Per Second (TPS)***
- Capture capacity: 40 million x 128 bytes buffers / 4 million full-size buffers

- Stateful TCP traffic load generation
- Scalable performance via license upgrade
- Supports 1/2.5/5/10/25/40GE optical or copper Ethernet interfaces for L4-7

* 24M TCP Clients and 24M TCP Servers on one VulcanBay
** Measured at 1M CC per 10G port
*** Measured at 10 transactions per connection



Pay for the speeds you need

There are three port/speed versions of the VulcanBay – and then you enable the ports and speeds you need with a simple license upgrade. You buy **Speed licenses** to enable the speeds you need.

Vul-V1G-P

Speed License

Enables 1G
on a Test Port

Vul-V10-P

Speed License

Enables 1GE/
2.5GE/5GE/10GE
on a Test Port

Vul-V25-P

Speed License

Enables 1GE/2.5GE/
5GE/10GE/25GE
on a Test Port

Vul-V40-P

Speed License

Enables 1GE/2.5GE/
5GE/10GE/25GE/
40GE on a Test Port



Vulcan L4-7 Software

- VulcanManager
- VulcanAppMix (VAM)



VulcanManager

The Vulcan L4-7 software you'll use most of the time

This is a Windows-based application used to configure and generate streams of Ethernet traffic between our Layer 4-7 test equipment and devices under test (DUTs) at all speeds up to 100 Gbps, and analyze the results.

It is included free with every system sold and the latest version can always be downloaded here: <https://xenonetworks.com/l47-downloads/>



USER-FRIENDLY GUI

The screenshot displays the ENA GUI interface. At the top, a ribbon contains tabs for 'Edit', 'Run Test', and 'Reporting'. The 'Edit' tab is active, showing icons for 'Chassis', 'Test', 'Add Testcase', and 'Add Scenario'. Below the ribbon, there are three main sections: 'Explorers', 'Test setup', and 'Test Configuration State'. The 'Test Explorer' on the left shows a tree structure for 'Scenario 0' with sub-items like 'Device under test', 'Subnets', 'Test cases', and 'Test case 0'. The main area shows configuration for 'Scenario 0' under 'Layer 4 - TCP', with settings for 'TCP (Client)' and 'TCP (Server)'. Callout 1 points to the tree structure, callout 2 points to the ribbon, and callout 3 points to the TCP configuration parameters.

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

2 Top ribbon provides instant access to most commonly used functions

3 Many tweakable TCP parameters such as congestion control algorithm, MSS, retransmission etc

Ver. 1.15.22.0 Ready. haoyu



USER-FRIENDLY GUI

Test case 0

Description
Name:

Distribution of total users

17% Youtube
11% Facebook
26% Email application
33% Amazon
13% Scenario 0

Testcase
Total Users: 460000
Total Connections: 3520000

Concurrent Users

600.0 k
300.0 k
0
0 5 10 15
Users
Time [Sec]

Identity | **Subnets - Ports** | **Load Profile** | **Line Rate Utilization**

Active	Type	Name	Client Subnet	Server Subnet	Client Port	Server Port	Users	Client TX Weight	Server TX Weight
<input type="checkbox"/>	Http GET	Scenario 0	Client IPv4	Server IPv4	P-0-1-10 ● ○ 🌀	P-0-1-11 ● ○ 🌀	60,000	↕ 20.00 % ↕	↕ 20.00 % ↕
<input type="checkbox"/>	Play	Amazon	Client IPv4	Server IPv4	P-0-1-10 ● ○ 🌀	P-0-1-11 ● ○ 🌀	150,000	↕ 20.00 % ↕	↕ 20.00 % ↕
<input type="checkbox"/>	Play	Email application	Client IPv4	Server IPv4	P-0-1-10 ● ○ 🌀	P-0-1-11 ● ○ 🌀	120,000	↕ 20.00 % ↕	↕ 20.00 % ↕
<input type="checkbox"/>	Play	Facebook	Client IPv4	Server IPv4	P-0-1-10 ● ○ 🌀	P-0-1-11 ● ○ 🌀	50,000	↕ 20.00 % ↕	↕ 20.00 % ↕
<input type="checkbox"/>	Play	Youtube	Server IPv4	Server IPv4	P-0-1-10 ● ○ 🌀	P-0-1-11 ● ○ 🌀	80,000	↕ 20.00 % ↕	↕ 20.00 % ↕

Column Groups

- Subnets - Ports
- Load Profile
- Line Rate Utilization

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

Convenient reporting options make it easy to export and document results

1

2



VulcanAppMix (VAM)

Test your networks or devices with “real” traffic

VAM is a free library of application traffic and protocols in pcap format that makes it easy to set up large-scale realistic traffic from various applications, using pre-defined traffic and mix templates.



Winner - VulcanAppMix



VAM Applications

Amazon
App Store App
Apple Map
AWS S3
Bing Search
BitTorrent
Bloomberg
Chrome
Chrome Incognito
CNN
DNS
Dropbox
eBay
Email application
Facebook
Facebook Messenger
Finance orders (FIX4.0)

Finance orders (FIX4.1)
Finance orders (FIX4.2)
Finance orders (FIX4.3)
Finance orders (FIX4.4)
Finance orders (FIX5.0)
Finance orders (FIXT1.1)
Firefox
Firefox Private
Flickr
Gmail Web
Google App
Google Calendar
Google Hangouts App
Google Search
Google Drive
Google Maps
Hotmail Web

Instagram
iOS Calendar
IoT Publish
IoT Publish over TLS
iTunes App
LINE App
LinkedIn
Mobile Bank
MySQL
MySQL over TLS
Outlook Web Mail
Paypal
QQ App
Reddit
Remote Desktop
RSS Feed
SIP VoIP

Skype
Slack App
Tumblr
Twitter
Video stream 1080p over HTTP
Video stream 1080p over RTP
WeChat App
Weibo
Wikipedia Search
Yahoo
Yahoo Mail Web
YouTube



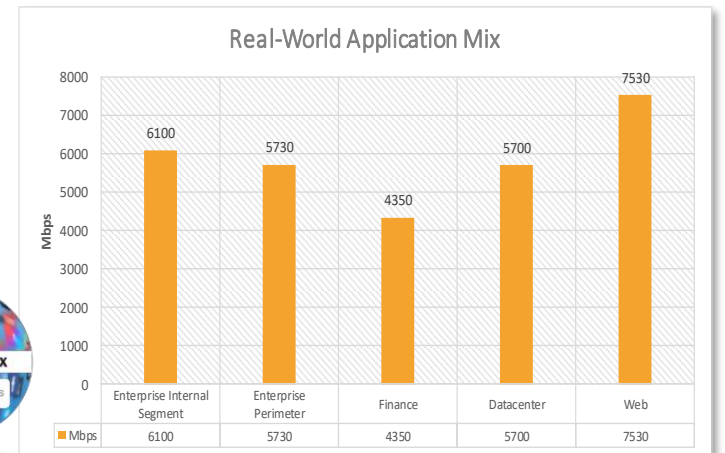
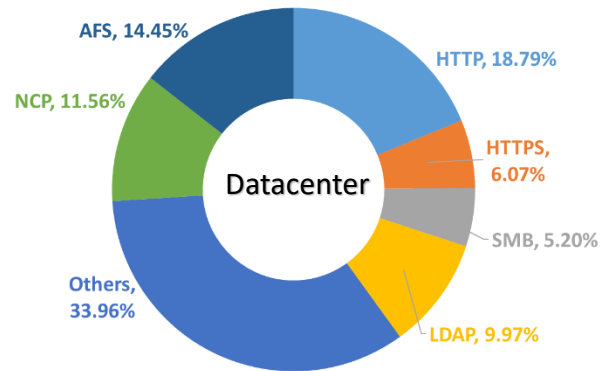
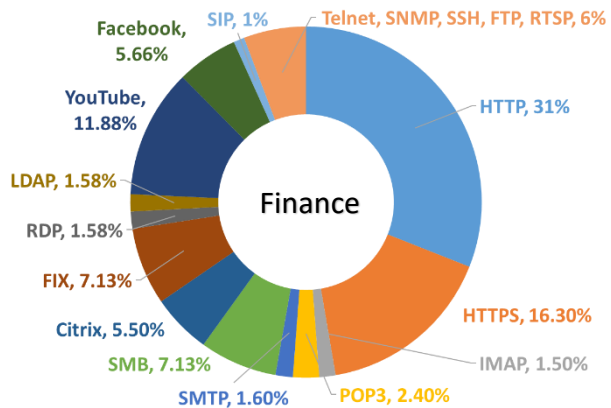
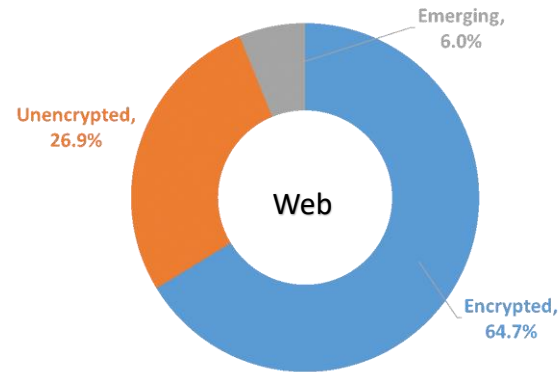
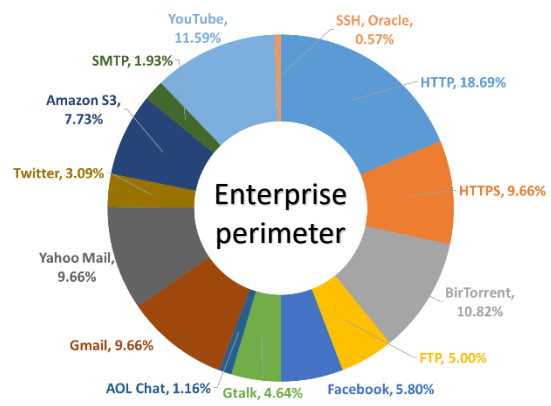
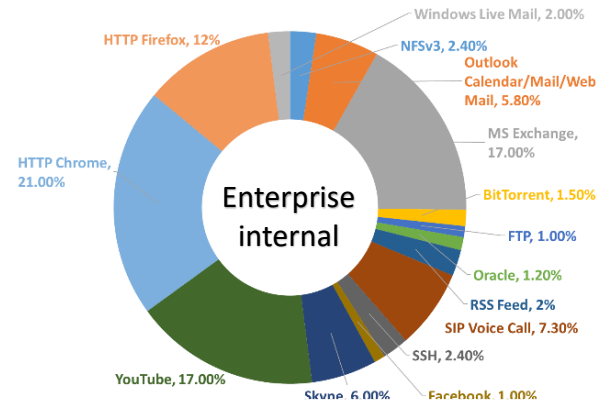
VAM Protocols

AFS	FTP (passive)	NFSv2	SRTP
BitTorrent	HTTP	NFSv3	SSDP
DNS	HTTPS	POP3	SSHv2
Echo	IMAP	POP3 over TLS	TELNET (per-character)
FIX4.0	IMAPS	QUIC	TELNET (per-line)
FIX4.1	LDAP	RDP	TFTP Read Request
FIX4.2	LLMNR	RTP/RTCP	TFTP Write Request
FIX4.3	MDNS	RTSP	
FIX4.4	MQTT	SIP	
FIX5.0	MQTTS	SMB2	
FIXT1.1	MSExchange MAPI	SMTP	
FTP (active)	NBNS	SMTP over TLS	



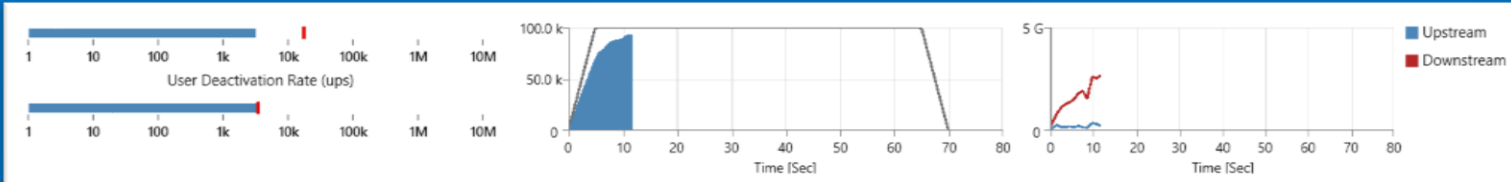
REAL TRAFFIC EMULATION

VAM Mixes





REAL TRAFFIC EMULATION



AppMix Scenario 0

Application Mix

Users

	Rate (ups)	Current	Total
Activated	3,148	92,561	123,430

Throughput (bps)

	Downstream	Upstream	Total
Load	2,660,971,039	252,144,780	2,917,637,171
Forwarding	2,660,948,210	252,164,271	2,917,633,711

Layer 5-7 Volume (Bytes)

	Downstream	Upstream	Total
Load	2,350,348,629	339,857,496	2,695,858,941
Forwarded	2,350,348,176	339,857,454	2,695,858,446

Application Mix

	Current Sessions	Total Sessions	Throughput (bps)
HTTP III-1	7,142	7,259	396,927,560
HTTPS III-3	7,142	7,142	361,403,532
BitTorrent	6,923	10,552	393,878,182
FTP (passive)	4,665	17,636	8,756,203
Facebook II	7,142	7,142	264,913,800
Facebook Messeng	7,142	7,142	247,734,721
Google Hangout	7,142	7,142	53,468,472
Gmail Web	7,142	7,142	47,724,215
Yahoo Mail II	7,142	7,142	380,351,925
Twitter	7,142	7,142	279,306,745
AWS S3	7,142	7,142	4,085,649
SMTP	7,142	7,142	174,820
Youtube II	7,142	7,142	475,623,129
Oracle MySQL	2,411	16,563	2,284,758

TCP Events

- ▲ TCP Retransmit - Client
- ▲ TCP Retransmit - Server
- ▲ TCP Errors - Client
Segments Not Sent 0 seg
- ▲ TCP Errors - Server

AppMix Scenario U Enterprise Mix (Perimeter)

Description
 Name: Scenario 0
 Is Active:
 Comment: Application Mix

Application Mix Configuration
 Test Objective: Layer 5-7 Volume (Bytes)
 Concurrent Users: 100000
 Ramp Duration: 5 sec
 Traffic Duration: 60 sec

Layer 5-7 Volume (Bytes)

Identity	Content	Connections	TCP	UDP	Payload Size	Payload Distribution (Up - Down)
HTTP III-1		1	✓		110 kB	0.5 % 99.5 %
HTTPS III-3		1	✓		298 kB	4.8 % 95.2 %
BitTorrent		5	✓		72 kB	3.2 % 96.8 %
FTP (passive)		3	✓		733 B	15.1 % 84.9 %
Facebook II		8	✓		17 MB	0.7 % 99.3 %
Facebook Messenger		14	✓	✓	281 kB	14.9 % 85.1 %
Google Hangout		2	✓		59 kB	26.5 % 73.5 %
Gmail Web		50	✓	✓	991 kB	6.3 % 93.7 %
Yahoo Mail II		14	✓		4 MB	1.9 % 98.1 %
Twitter		6	✓		457 kB	4.1 % 95.9 %
AWS S3		1	✓		4 MB	0.0 % 100.0 %
SMTP		1	✓		45 kB	99.4 % 0.6 %
Youtube II		4	✓	✓	24 MB	1.6 % 98.4 %
Oracle MySQL		1	✓		287 B	61.2 % 38.7 %

Column Groups
 Identity
 Content
 Application Mix



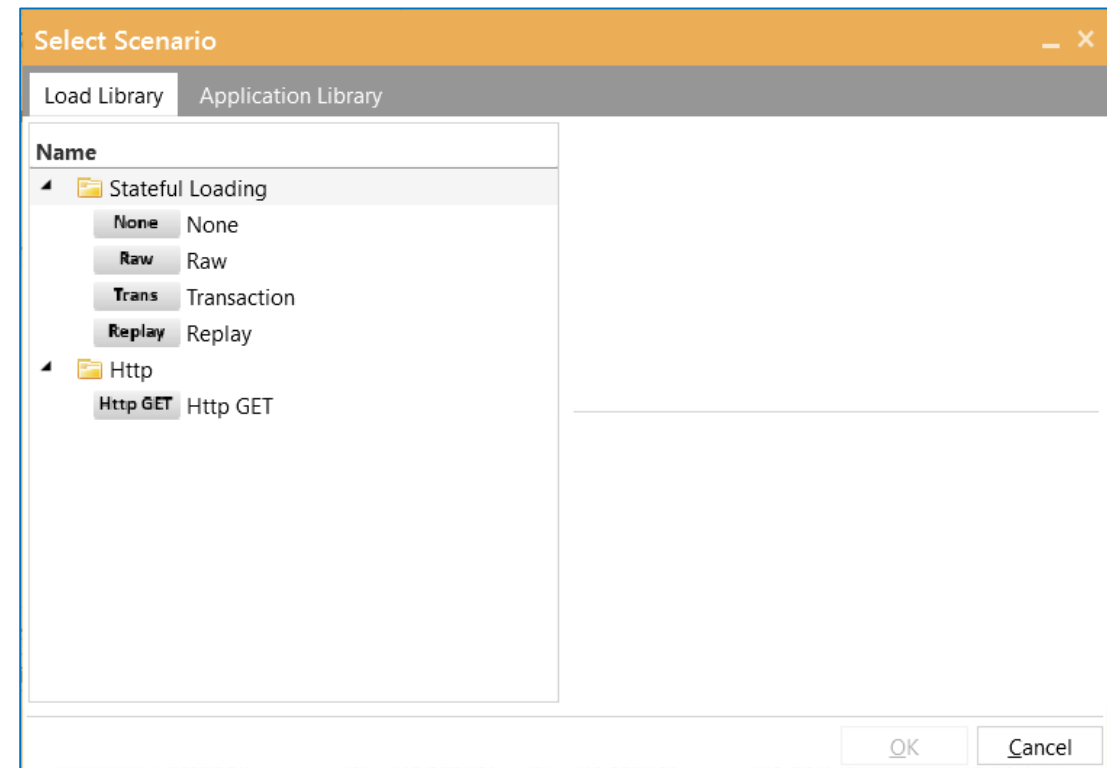
KEY FEATURES

- Stateful TCP for Extreme Load Performance Testing
- TLS performance testing with different cipher suites and certificates
- Stateful Layer 4 Payload Replay
- Scalable Application Emulation
- Wired-speed Traffic Capture
- Connection-oriented Traffic Generation
- Transaction-based Traffic Generation
- Ease of Use & Debug



Stateful TCP for Extreme Load Performance Testing

- TCP stack handles connection establishment, retransmission, and connection tear-down
- Support TCP congestion control: Reno, New Reno
- Support dynamic and static RTO (retransmission timeout)
- Support RTT (round-trip time latency) measurement
- TCP CPS (connection per second) up to 6 million
- TCP CC (concurrent connections) up to 24 million





KEY FEATURES

TLS Performance Testing

VulcanManager supports TLS 1.2 performance testing e.g. handshakes per second, TLS throughput, concurrent TLS connections, etc.

Users can specify different cipher suites and certificate key sizes.

In Xena's native TLS, this lets you test a device that acts in TLS proxy mode, where the device decrypts traffic on one side and encrypts on the other.

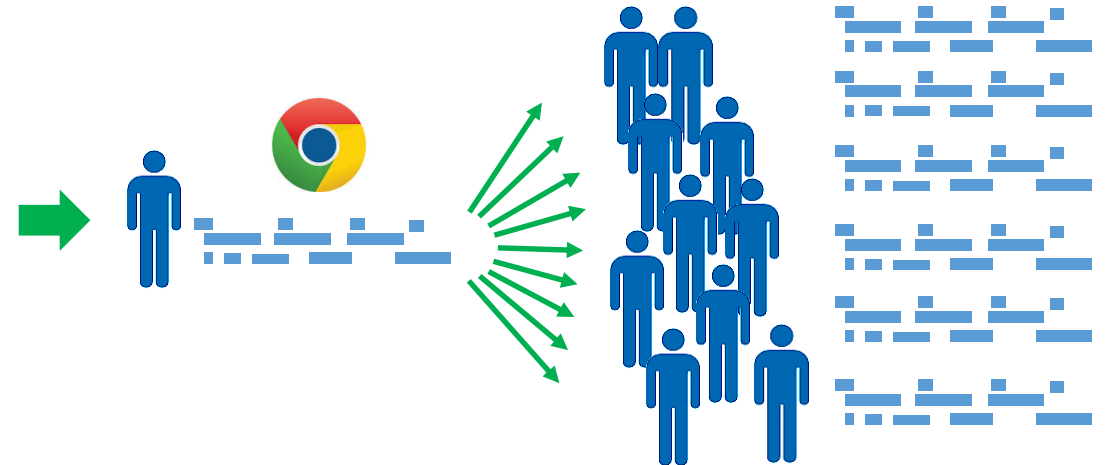
The screenshot shows the configuration for 'Scenario 0' under the 'Transport Layer Security' section. It is divided into two main columns: 'TLS Client' and 'TLS Server'. Both columns have an 'SSL Record Size' field set to '8087 bytes'. The 'TLS Client' has a 'Send Close Notify' checkbox which is unchecked. The 'TLS Server' has an 'SSL Certificate' dropdown menu set to 'Xena Untrusted 1024', with 'Import' and 'Export' buttons below it. Both columns have a 'Cipher Suite Collection' dropdown menu set to 'Xena Default'. Below these are two scrollable lists titled 'Included Cipher Suites in Preferred Order'. Both lists contain the same set of cipher suites: (C0, 2F) - ECDHE_RSA_WITH_AES_128_GCM_SHA256, (C0, 30) - ECDHE_RSA_WITH_AES_256_GCM_SHA384, (CC, A8) - ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256, (C0, 13) - ECDHE_RSA_WITH_AES_128_CBC_SHA, (C0, 14) - ECDHE_RSA_WITH_AES_256_CBC_SHA, (00, 9C) - RSA_WITH_AES_128_GCM_SHA256, and (00, 9D) - RSA_WITH_AES_256_GCM_SHA384. Each list has an 'Edit' button at the bottom right.



Stateful Layer 4 Payload Replay

- Importing PCAP for Replay scenario
- PCAP files are parsed and payload extracted for replay
- Replay on top of TCP stack
- Support one-to-many communication pattern in PCAP
- Capable of scaling from one user to millions

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [RST] Seq=32768 Len=0 RST=108
2	0.000000	22.0.0.14	22.0.0.12	TCP	64	118 → 4497 [RST, ACK] Seq=32768 Len=0 RST=108
3	0.012011	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [ACK] Seq=1 Ack=32768 Len=0
4	0.041501	22.0.0.14	22.0.0.12	POP	127	118 → 4497 Internet Communications, Web Reflector Pop3 Server (
5	0.041500	22.0.0.12	22.0.0.14	POP	78	C: USER user2
6	0.062017	22.0.0.14	22.0.0.12	POP	96	S: 406 Password required for user user1
7	0.062019	22.0.0.12	22.0.0.14	POP	78	C: PASS user1
8	0.083500	22.0.0.14	22.0.0.12	POP	88	S: 406 user1 user logged in
9	0.083514	22.0.0.12	22.0.0.14	POP	64	C: STAT
10	0.104016	22.0.0.14	22.0.0.12	POP	73	S: 406 1 13381
11	0.104025	22.0.0.12	22.0.0.14	POP	64	C: RETR 1
12	0.125500	22.0.0.14	22.0.0.12	POP	1518	S: 406 13381 retre
13	0.126114	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
14	0.126122	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [ACK] Seq=39 Ack=3867 Win=32768 Len=0
15	0.126137	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
16	0.126139	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
17	0.126171	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [ACK] Seq=39 Ack=3867 Win=32768 Len=0
18	0.126182	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
19	0.126185	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
20	0.126518	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [ACK] Seq=39 Ack=3867 Win=32768 Len=0
21	0.147204	22.0.0.14	22.0.0.12	TCP	1518	S: DATA Fragment, 1408 bytes
22	0.147407	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
23	0.147414	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [ACK] Seq=39 Ack=11827 Win=32768 Len=0
24	0.147430	22.0.0.14	22.0.0.12	POP	1518	S: DATA Fragment, 1408 bytes
25	0.147575	22.0.0.14	22.0.0.12	POP	637	S: DATA Fragment, 599 bytes
26	0.147583	22.0.0.12	22.0.0.14	POP	64	C: QUIT
27	0.168300	22.0.0.14	22.0.0.12	POP	79	S: 406 Closing mailbox
28	0.168307	22.0.0.12	22.0.0.14	TCP	64	118 → 4497 [RST, ACK] Seq=11888 Ack=32768 Len=0
29	0.168373	22.0.0.12	22.0.0.14	TCP	64	4497 → 118 [RST, ACK] Seq=8 Ack=11888 Win=32768 Len=0
30	0.185255	22.0.0.14	22.0.0.12	TCP	64	118 → 4497 [ACK] Seq=11888 Ack=40 Win=32768 Len=0

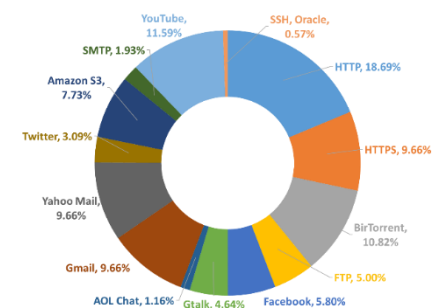
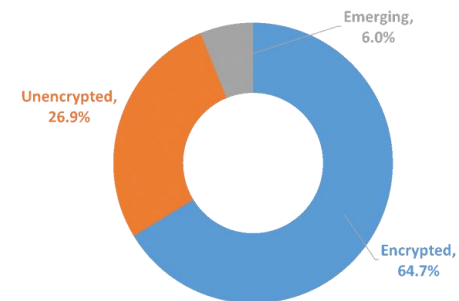
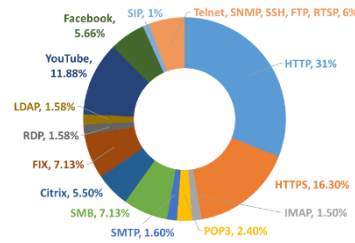
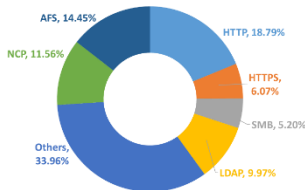
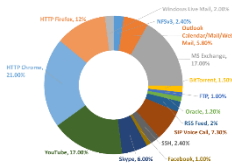




KEY FEATURES

Scalable Application Emulation

- Real-world traffic for application emulation via VulcanManager & VAM
- Pre-defined protocol-oriented, application-oriented, and traffic profile mixes of different network scenarios
- Replay up to 200 pre-defined application scenarios can be simultaneously, each covering one-to-many communication scenarios that can scale up to millions of concurrent connections, connections per second, transactions per second, users and throughput with real-world traffic





Wired-speed Traffic Capture

- Capture network traffic into industry standard PCAP format
- Excellent for debug and traffic analysis
- Up to 40M capture entries

The screenshot displays the XENA software interface. At the top, there are tabs for 'Edit', 'Run Test', and 'Reporting'. The 'Reporting' tab is active, showing a 'Demo Test Case' with a 'Running' state and 34% progress. Below this, there are several charts: 'User Activation Rate (ups)', 'Current Users (user)', and 'Layer 5-7 Throughput (bps)'. The 'Layer 5-7 Client' section contains a table with the following data:

Layer 5-7 Client	
Users	
Current Active	999,956 user
Total Active	1,953,773 user
Activation Rate	100,050 ups
Max Activation Rate	100,050 ups
Throughput	
Load	10,261,301,970 bps
Throughput	10,264,912,711 bps
Max Throughput	10,484,063,363 bps
Total Forwarded	18,879,311,004 byte
Throughput Upstream	
Load	1,980,411,239 bps
Throughput	1,979,824,341 bps
Max Throughput	2,252,866,360 bps
Total Forwarded	3,709,536,204 byte
Throughput Downstream	
Load	8,280,890,731 bps
Throughput	8,285,088,370 bps
Max Throughput	8,587,001,147 bps
Total Forwarded	15,169,774,800 byte
Transactions	
Transaction Rate	972,335 tps
Max Transaction Rate	1,007,820 tps
Total Transactions	14,244,140 trans

The 'Layer 4' section contains a table with the following data:

Layer 4	
TCP Connection Rates	
Establish Rate	100,040 cps
Max Establish Rate	100,045 cps
Close Rate	100,020 cps
Max Close Rate	100,023 cps
TCP Connection Current	
Attempting	8 con
Established	999,950 con
TCP Connection Total	
Attempted	1,953,761 con
Established	1,953,751 con
Closed	953,791 con
TCP Events - Client	
Protocol Events	0 event
Retransmission Events	0 event
TCP Events - Server	
Protocol Events	0 event
Retransmission Events	0 event

The 'Layer 1-3 Client' section contains a table with the following data:

Layer 1-3 Client	
Ethernet L1 Bit Rate	
Tx Rate	3,543,328,551 bps
Rx Rate	9,784,321,308 bps
Ethernet L2 Bit Rate	
Tx Rate	3,076,241,928 bps
Rx Rate	9,345,967,728 bps
Ethernet Packet Rate	
Tx Packet Rate	2,393,185 pps
Rx Packet Rate	2,292,333 pps
Ethernet Packets Total	
Tx Packets	35,385,766 packet
Rx Packets	33,431,797 packet
Ethernet Events	
Tx Errors	0 event
Rx Errors	0 event
Packet Reception Loss	0 event

A callout box highlights the 'Capture to PCAP' button and provides instructions: 'Capture traffic to pcap format. Right click on port to view the capture with Wireshark.'



Connection-Oriented Traffic Generation

TCP connections can be customized by modifying the MAC/IP/TCP headers to create variations in the generated packets.

Traffic rates are specified as a percentage of line rate, frames per second or bit-rate, and traffic generation is controlled by a load profile specifying the speed with which connections are established and terminated.

The TCP payload can be automatically generated (random, incrementing) or customized. Payloads can also be loaded from files and different congestion control algorithms can be used to test network behavior.

The screenshot displays the configuration for 'Scenario U' under the 'Connection establishment' tab. It is divided into several sections:

- Subnet Selection:** Client Subnet (Client IPv4), Server Subnet (Server IPv4), Subnet size (16,777,213), Used IP addresses (70,000), and Used IP Range (10.0.0.2 - 10.1.17.113).
- User Connections Setup:** Number of Source Ports (1), Use Ephemeral Source Port Range (checked), Source Port Minimum (49152), Connections per User (1), Number of Destination IP Addresses (1), Number of Destination Ports (1), and Destination Port Minimum (80).
- Connection Establishment Profile:** Total Users (70,000) and Total Connections (70,000).
- Connection Updates:** Connection Rebirth (No rebirth) and Repetitions (1).
- Concurrent Users:** A line graph showing the number of users over time. The Y-axis is 'Users' (0 to 60.0 k) and the X-axis is 'Time [Sec]' (0 to 120). The graph shows a step-like increase in users from 0 to approximately 30,000 at 10 seconds, then to 45,000 at 25 seconds, and finally to 55,000 at 35 seconds, remaining constant until 100 seconds.
- Table:** A table with columns: Users, Offset, Up, Steady, Down, Time Scale, and Segments. It lists three segments: 10000 (Offset 0, Up 1, Steady 100, Down 1, Seconds), 20000 (Offset 5, Up 1, Steady 20, Down 1, Seconds), and 40000 (Offset 30, Up 1, Steady 20, Down 1, Seconds).



KEY FEATURES

Transaction-based Traffic Generation

Makes it easy to emulate transaction-based traffic based on the request-response communication model.

With the customizable HTTP template and configuration transactions per TCP connection, users can create millions of HTTP transactions for HTTP capacity testing, e.g. HTTP connections per second, HTTP transactions per second, and HTTP throughput at various response sizes.

Trans **Demo Scenario**

Description

Name:

Is Active:

Comment:

Behavior

Transactions Type:

Transactions:

Connection closed by:

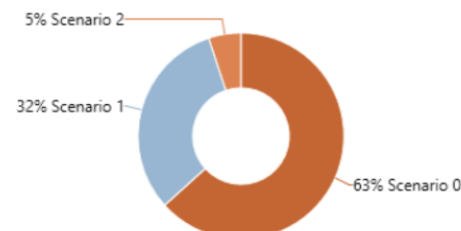
Request Object Size: 242 bytes

Response Object Size: 1065 bytes

Description

Name:

Distribution of total users

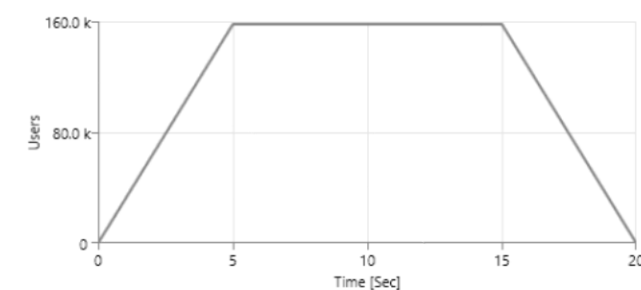


Testcase

Total Users: 158000

Total Connections: 158000

Concurrent Users



Identity		Subnets - Ports				Load Profile		Line Rat
Active	Type	Name	Client Subnet	Server Subnet	Client Port	Server Port	Users	Client
<input type="checkbox"/>	Http GET	Scenario 0	Client IPv4	Server IPv4	P-0-1-10	P-0-1-11	100000	⚙️
<input type="checkbox"/>	Http GET	Scenario 1	Client IPv4	Server IPv4	P-0-1-10	P-0-1-11	50000	⚙️
<input type="checkbox"/>	Http GET	Scenario 2	Client IPv4	Server IPv4	P-0-1-1	P-0-1-3	8000	⚙️

Column Groups

- Subnets - Ports
- Load Profile
- Line Rate Utilization



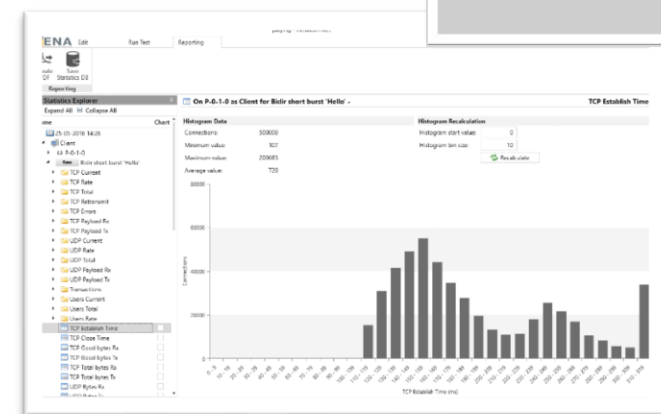
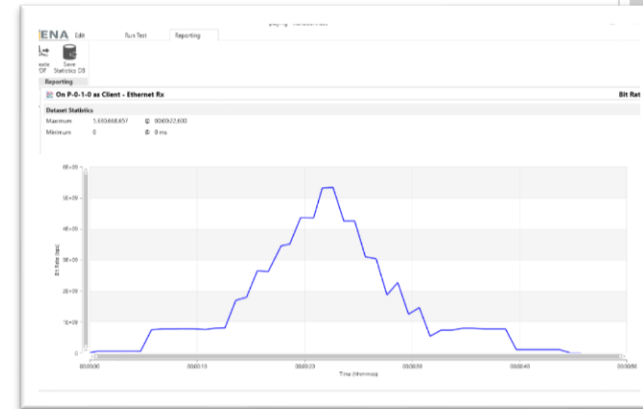
KEY FEATURES

Ease of Use & Debug

Vulcan L4-7 test platform is scalable and can be used to quickly and easily generate millions of TCP connections with specified load profiles and configurable IP/TCP/Payload parameters. Real time stats and test reports provide an in-depth overview of the DUT/SUT characteristics.

Xena's L4-7 test modules are suited for multi-user environments at the level of per-port reservation. Packet Engines (PE's) mean performance can be allocated individually depending on the test scenario, for full operational flexibility.

Enabling the capturing function, users can record communication traffic between test ports as a pcap file for in-depth analysis of the network behavior of the DUT/SUT.





APPLICATIONS

- TLS Middlebox Performance Testing
- Firewall Performance Testing
- Lab-based Performance Testing
- WAN Testing

TLS Middlebox Performance Testing

Testing TLS performance is vital for balancing security and performance. It is essential that the test equipment can get the encrypted TLS traffic through the DUT that is operating in the TLS middlebox/proxy mode. Otherwise, the test will be invalid.

Adopting the latest encryption standard, Xena TLS gives users high-performance test solutions that can reveal the performance bottleneck of their TLS/HTTPS middleboxes/proxies, address security performance testing requirements, and optimize their security parameters.

Key test parameters are:

- TLS handshake per second
- TLS throughput
- HTTPS connection per second
- HTTPS transactions per second
- TLS record size optimization
- TLS cipher suites and key size impact





Firewall Performance Testing

Vulcan L4-7 platform can validate four phases of firewall deployment

1. Choice of vendor

Test how different products perform under real-world conditions to find the one that best matches your needs and budget



2. Pre-deployment

Make sure your firewall is ready to handle the real world traffic loads - before it goes live



3. Firmware update

Confirm that new firmware hasn't deprecated your firewall's capabilities and performance



4. Network re-design

Test your firewall as your network evolves to ensure it still provides the performance needed



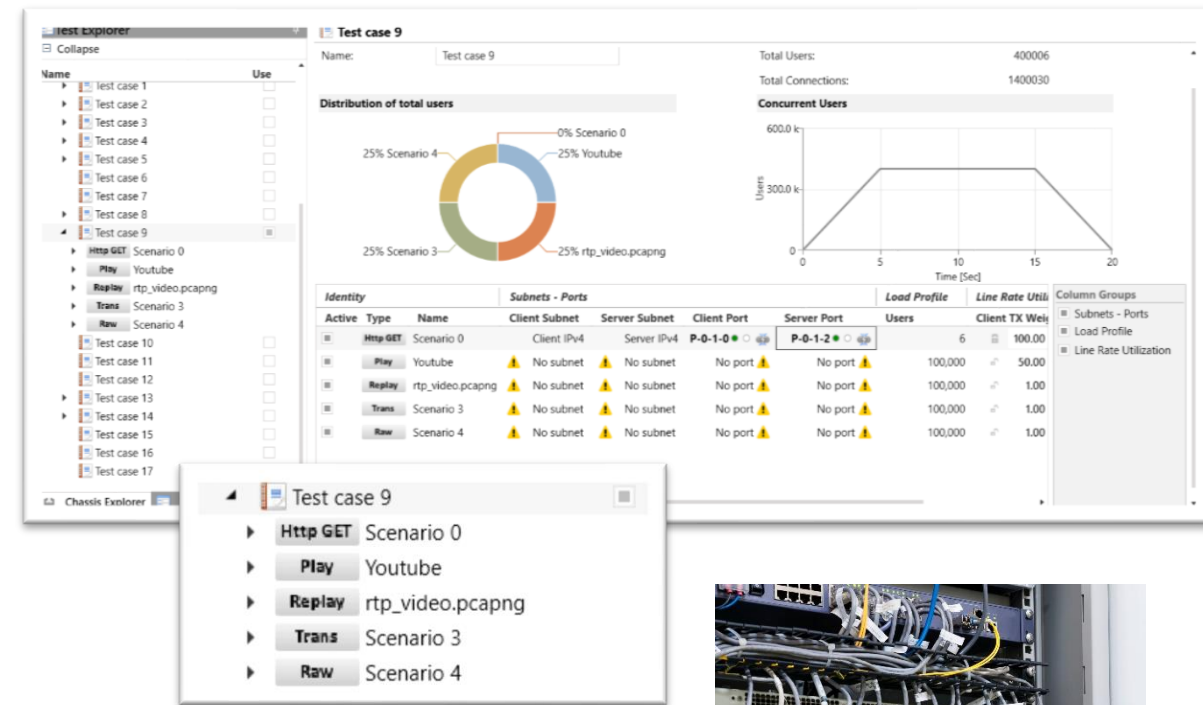


Lab-based Performance Testing

Ideal for validating network device performance in development and production environments.

High port density means large port-count test beds can be set up at a fraction of the cost of existing test solutions with test topologies ranging from L2 forwarding such switches, over packet routing, to caching and network application servers. These can be tested individually or combined into functional networks.

Lab-based testing during development is used to load routers and other forwarding devices with large-scale, realistic stateful TCP sessions to verify forwarding performance.





WAN Testing

L4-7 makes it easy to test the capacity and performance of WANs (& SD-WANs) of service providers and large enterprise networks – where the focus is more on system-wide performance.

Relevant test parameters are:

- Optimal MSS,
- Traffic prioritization using Differentiated Services (DS) and other QoS mechanisms,
- End-to-end TCP Throughput in a managed IP network (RFC6349)
- Verify guaranteed bandwidths according to SLAs.

For carriers, testing can qualify performance before service roll out.

WAN testing can also take place over large geographical distances requiring simultaneous control over multiple traffic generators.





Coming up...

- Enhanced payload editor
- TLS Server Name Indication (TLS SNI)
- HTTP statistics
- One-way latency

Firewall testing for Enterprises

- Automated performance testing of enterprise class firewalls



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