



STATEFUL TCP/UDP

traffic generation and analysis

Ideal for validating firewalls, switches, routers, NAT routers, proxies, load-balancers, bandwidth shapers and more.

VULCAN LAYER 4-7
GIGABIT ETHERNET TEST PLATFORM



Vulcan Layer 4-7 platform – in a nutshell

Xena's L4-7 test platform is used for generating stateful Layer 4-7 Ethernet traffic and analyzing how advanced networking devices and infrastructure perform in a wide range of real-world scenarios.

Xena's L4-7 test platform is comprised of two chassis – a portable all-in-one XenaAppliance which can include an optional L2-3 test module (either 1GE or 10GE), or the large XenaScale which is for big-scale ultra-high performance testing. Both come equipped with packet-engines that can be licensed for scalable test performance.

The traffic generation and analysis capabilities of the two L4-7 test chassis are accessed via XenaConnect, a free Windows GUI client provided for ad-hoc test execution, and remote management of test equipment located in multiple locations.

Scripting and test automation are also supported by the Xena L4-7 platform.

Xena's L4-7 test platform distinguishes itself from its competitors by its ease-of-use, highly scalable performance, real-world applications and future-proof cost-efficiency.

Super-friendly

A hallmark of Xena solutions is their ease-of-use:

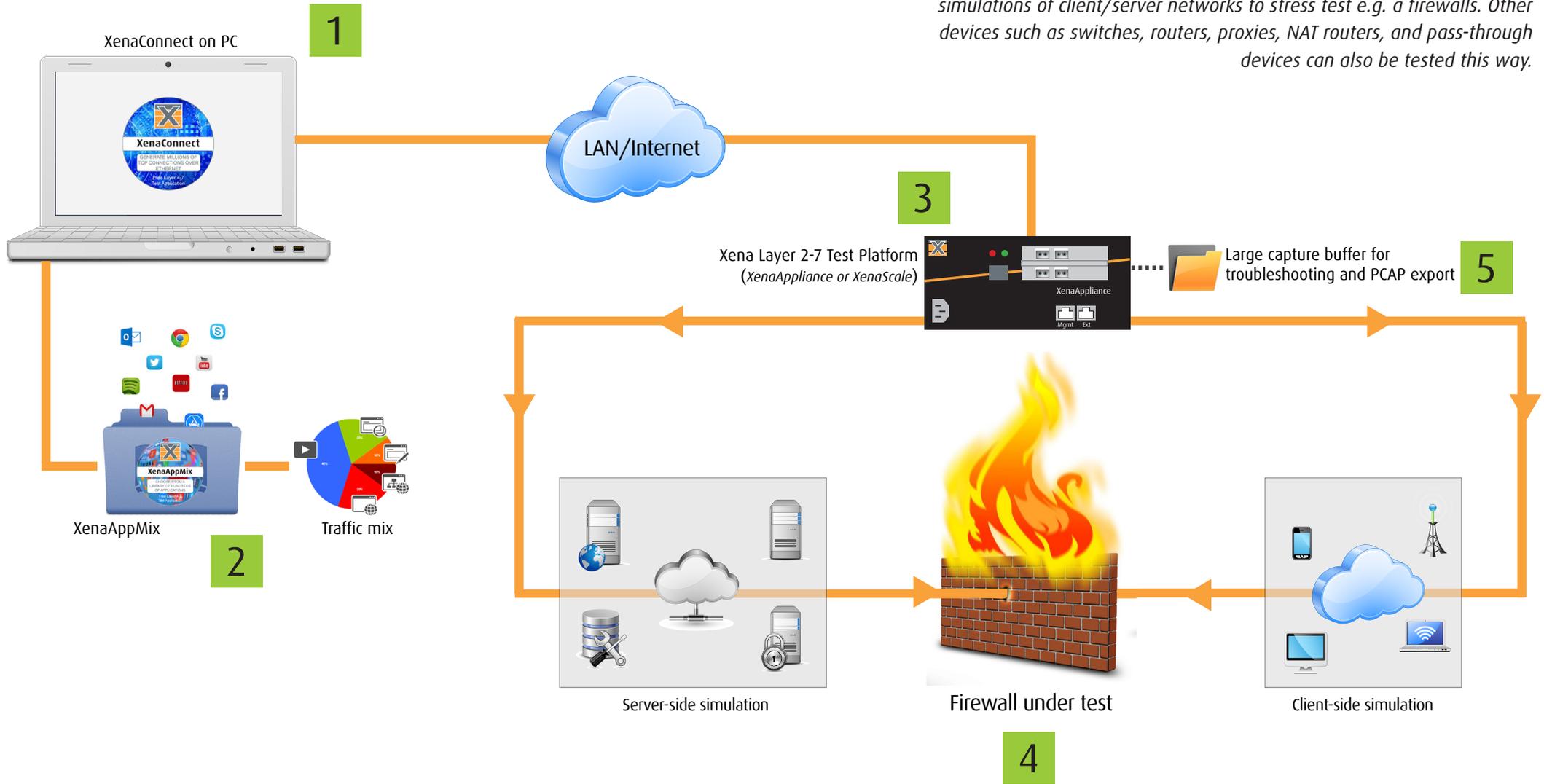
- The software is native to Windows, and can be freely downloaded from the Internet. Double-click to launch, enter an IP address and a password, and you are ready to test.
- Centralized upgrades make it quick and easy to install the latest software across multiple testers for immediate access to the newest features and bug fixes.
- All devices can be administered from the same user-friendly GUI to ensure fast, efficient testing – without the big learning curve that go with our competitors' products.
- To make remote testing even easier, Xena offers XenaWeb – a browser-based (HTML5) user-interface that lets engineers access their test system from any OS.
- Xena's L4-7 test solutions are also ready for virtualization ensuring low-cost future-proof migration to cloud-based testing.



Innovation, ease of use and price-performance are the hallmarks of Xena solutions



OVERVIEW



This diagram shows how Xena L4-7 test platform can be used in complex simulations of client/server networks to stress test e.g. a firewalls. Other devices such as switches, routers, proxies, NAT routers, and pass-through devices can also be tested this way.

- 1** XenaConnect is installed on a PC and connects to the Layer 2-7 platform via an IP address.
- 2** Choose protocols, applications and mixes to be emulated from XenaAppMix (running with XenaConnect) – or import your own PCAP for replay.
- 3** Use XenaConnect to configure, run and analyze your test.
- 4** Test firewall performance with various applications and scenarios.
- 5** Use the large capture buffer for troubleshooting & PCAP export. Or use XenaConnect for report generation.



Xena Layer 4-7 platform can be used for many different test scenarios

■ Application Emulation and Advanced Replay

The Xena L4-7 test platform delivers highly scalable application emulation based on a pre-defined library of application traffic and protocols called XenaAppMix. Enabled in XenaConnect, up to 200 pre-defined application scenarios can be played simultaneously, each covering one-to-many communication scenarios that can scale up to millions of connections with real-world traffic.

With pre-defined traffic mixes for specific segments e.g. enterprise and finance, users can test DUT throughput performance, which can vary dramatically under different traffic profiles.

Users can also replay their own pcap files on the DUT to verify performance and validate network behavior, using Xena advanced Layer 4 replay function. Being able to choose different replay modes, users can reconstruct the real-world scenarios, or create their own traffic mixes for realistic throughput verification.

■ TLS Middlebox Performance Testing

Testing TLS performance is vital for balancing security and performance. And for the tests to be valid, it is essential that the test equipment can send encrypted TLS traffic through the DUT while it is operating in the TLS middlebox/proxy mode.

Supporting the latest encryption standard, Xena TLS reveals performance bottlenecks of TLS/HTTPS middleboxes/proxies, address security performance testing requirements, and optimize security parameters. Key TLS 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

■ 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.

■ Transaction-based Traffic Generation

The Xena L4-7 test platform provides great flexibility for users 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.



■ Lab-based Performance Testing

The Xena L4-7 test platform is 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 is used to load routers and other forwarding devices with large-scale, realistic stateful TCP sessions to verify forwarding performance. Key metrics are:

- maximum number of concurrent TCP connections (TCP CC),
- maximum connections per second (TCP CPS),
- maximum HTTP connections per second (HTTP CPS),
- maximum HTTP transactions per second (HTTP TPS),
- throughput and packet forwarding rates at various TCP segment sizes.

■ Network Infrastructure Test

The Xena L4-7 test platform can do capacity and performance testing for service providers and large enterprise networks. Here the focus is less on the individual forwarding devices and servers and more on system-wide performance.

Examples of relevant parameters are optimal MSS, prioritization of different types of network traffic using Differentiated Services (DS) and other QoS mechanisms, and to verify guaranteed bandwidths according to SLAs. For carriers, testing is done to qualify performance before service roll out. Network infrastructure testing can also take place over large geographical distances requiring simultaneous control over multiple traffic generators.

■ Ease of Use & Debug

The Xena 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.

■ Automation Package Creation

Xena offers an automation package function that puts the complex test configuration into a Python script. Instead of using Xena scripting APIs to create complex test scenarios, users can configure the test case, generate a script with a configuration file, and later execute the script in any OS platform for automated testing. Users can also modify the script bundle to create new test cases.

■ Wire-Speed Software Packet Processing

Xena's L4-7 solutions use the state-of-the-art technologies in software-based packet processing. The platform is based on Intel x86-64 and achieves wire-speed performance using a combination of hardware-based offloading technologies, distributed processing and advanced algorithms.

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L4-7 SOFTWARE



Included with every Xena L4-7 chassis is a valuable portfolio of software. You also receive one year's free software maintenance, plus of course the option for extending licensing.

XenaConnect



XenaConnect is a Windows-based GUI used to configure, generate and analyze traffic via the L4-7 hardware. It is used for application emulation, TLS testing, performance verification, load testing, analysis and characterization of Ethernet equipment and network infrastructure. This includes firewalls, switches, routers, NAT routers, proxies, bandwidth shapers, and more.

XenaAppMix

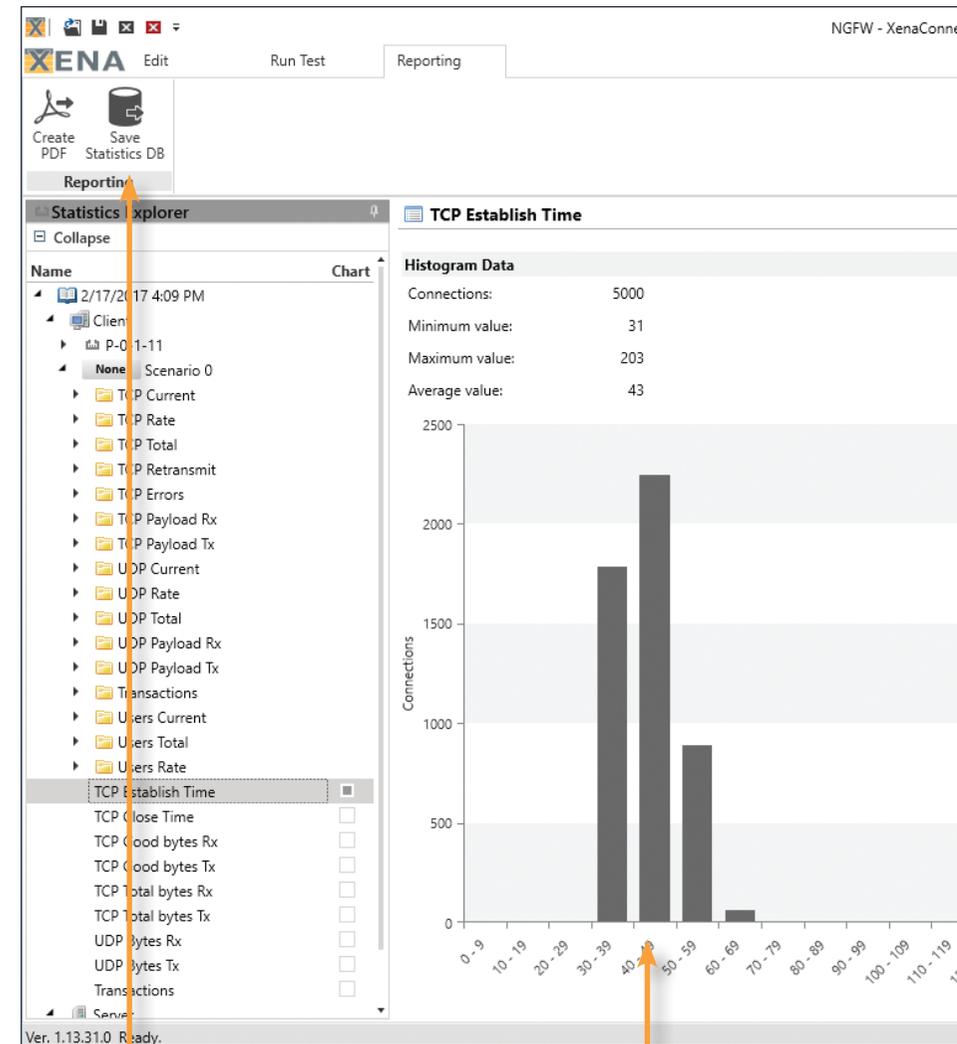


XenaAppMix (XAM) is a library of application traffic and protocols in pcap format. XAM makes it easy to set up large-scale realistic traffic from various applications, using pre-defined and customizable mix templates. Up to 200 pre-defined application scenarios can be played simultaneously, each covering a one-client-to-multiple-servers communications scenario that can be scaled up to millions of connections with real-world traffic.

XenaScripting



XenaScripting is a free text-based Command Line Interface (CLI) API that makes test automation on Xena testers easy to script from any scripting environment that supports TCP/IP. You can download it from Xena's website.



Create a report and save all statistics in a database file.

In-depth analysis of various statistics and graphs.

L4-7 SOFTWARE



Scenario 0 Layer 4 - TCP

TCP (Client)

- TCP Congestion Mode: Reno
- Window Size: 65535 bytes
- Enable Window Scaling:
- Window Scaling Factor: 0 bytes

Maximum TCP Segment Size (Client)

- Modifier Type: Fixed
- Value: 1460 bytes
- Minimum Value: 70 bytes
- Maximum Value: 1460 bytes

Retransmission (Client)

- Duplicate ACK Threshold: 3
- SYN Retransmission Timeout: 200 milliseconds
- SYN Retransmission Retries: 32
- SYN Retransmission Back Off: 3
- Retransmission Timeout: 200 milliseconds
- Retransmission Retries: 32
- Retransmission Back Off: 3

TCP (Server)

- TCP Congestion Mode: Reno
- Window Size: [empty]
- Enable Window Scaling:
- Window Scaling Factor: [empty]

Maximum TCP Segment Size (Server)

- Modifier Type: Fixed
- Value: [empty]
- Minimum Value: [empty]
- Maximum Value: [empty]

Retransmission (Server)

- Duplicate ACK Threshold: [empty]
- SYN Retransmission Timeout: [empty]
- SYN Retransmission Retries: [empty]
- SYN Retransmission Back Off: [empty]
- Retransmission Timeout: [empty]
- Retransmission Retries: [empty]
- Retransmission Back Off: [empty]

Test case 0

Description

Name: Test case 0

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

Subnets - Ports

Identity	Active	Type	Name	Client Subnet	Server Subnet	Client Port	Server Port	Load Profile	Line Rate Utilization
Scenario 0	<input type="checkbox"/>	Http GET	Scenario 0	Client IPv4	Server IPv4	P-0-1-10	P-0-1-11	60,000	Client TX Weight: 20.00% Server TX Weight: 20.00%
Amazon	<input type="checkbox"/>	Play	Amazon	Client IPv4	Server IPv4	P-0-1-10	P-0-1-11	150,000	Client TX Weight: 20.00% Server TX Weight: 20.00%
Email application	<input type="checkbox"/>	Play	Email application	Client IPv4	Server IPv4	P-0-1-10	P-0-1-11	120,000	Client TX Weight: 20.00% Server TX Weight: 20.00%
Facebook	<input type="checkbox"/>	Play	Facebook	Client IPv4	Server IPv4	P-0-1-10	P-0-1-11	50,000	Client TX Weight: 20.00% Server TX Weight: 20.00%
Youtube	<input type="checkbox"/>	Play	Youtube	Server IPv4	Server IPv4	P-0-1-10	P-0-1-11	80,000	Client TX Weight: 20.00% Server TX Weight: 20.00%

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

Multiple scenarios in one test case to emulate complex traffic mix and network environment.

Two chassis – multiple options

Xena L4-7 platform consists of two extreme performance Gigabit TCP test chassis for stateful traffic load testing, analysis and characterization of Ethernet equipment and network infrastructure.



XenaScale

This 19" rack-mountable chassis has 24 Packet Engines and comes in three port configurations: 12x10GE ports, a combination of 4x10GE ports and 2x40GE ports, or a combination of 4x10GE ports and 4x25GE ports. Ports can be enabled and performance is upgradable via licenses. XenaScale offers software-based capacity scaling. Once enabled, Packet Engines can be freely allocated across the available ports.

Massive Performance Testing

The Vulcan L4-7 test platform delivers blistering performance and capacity. This means realistic 1G/2.5G/5G/10G/25G/40G traffic generation:

- 24 million Concurrent Connections (CC)
- 10 million Connections Per Second (CPS)
- 4 million packets capture buffer



Xena Appliance

XenaAppliance is an ultra-compact "all-in-one" chassis that supports 1/10GE L4-7 interfaces and can also be equipped with 1G or 10G L2-3 test module, making it a complete L2-7 test platform.

Portable Testing

Smaller than a shoe-box, XenaAppliance is also a portable testing solution that can be brought to the edges of the transport network for performance validation. Examples are the DSLAM/Central Offices for wired access technologies such as ADSL or data plane gateways for wireless networks such as UMTS or 4G.