GL Communications Inc.

Ethernet/IP Test Solutions

August 2025

- **Variants PacketExpert™ - 1G and 10GX**
  - PacketExpert™ 1G - 4x 1Gbps ports
  - PacketExpert™ 10GX - 4x 1Gbps, 2x 10Gbps/2.5Gbps ports
- **PacketExpert™ Platforms**
  - PacketExpert™ USB Portable
  - PacketExpert™ Rack-mount
  - PacketExpert™ Probe
- **PacketExpert™ Functionalities**
  - Wirespeed BERT
  - Smart Loopback
  - RFC 2544 Testing
  - Record and Playback
  - ExpertSAM™
  - PacketBroker
  - Multi Stream UDP/TCP Traffic Generator and Analyzer
  - ExpertTCP™ - (Available with Multi Stream Traffic Generator Analyzer)
  - IPNetSim™ / IPLinkSim™ – WAN Emulators
  - CLI/API - Test Automation and Remote Accessibility

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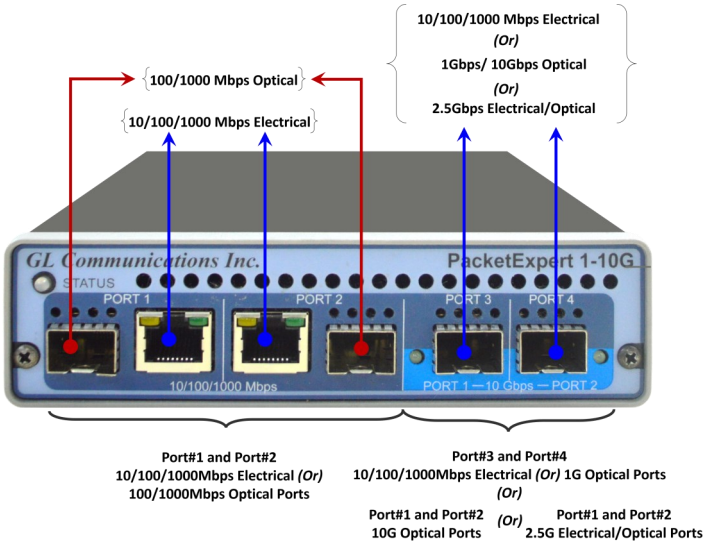
PacketExpert™ 1G, 10G, 10GX Variants



PacketExpert™ 10GX

PacketExpert™ 10GX - Portable

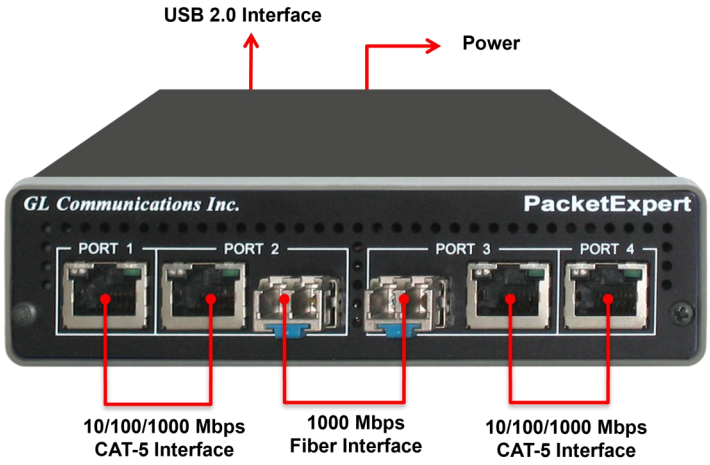
PacketExpert™ 10GX is a portable (USB based) Quad Port Ethernet / VLAN / MPLS / IP / UDP Tester with -

- 4x 1Gbps Electrical Ethernet Ports (10/100/1000 Mbps)
- 2x 10Gbps Optical Ports (100/10000 Mbps)/2.5Gbps Electrical/Optical Ports (2500 Mbps)
- Each GigE port provides independent Ethernet/VLAN/ MPLS/IP/UDP testing at wire speed for applications such as BERT, RFC 2544, and Playback, ExpertSAM™, PacketBroker, Multi Stream UDP/TCP Traffic Generator and Analyzer, and ExpertTCP.

The PacketExpert™ 10GX hardware is more compact with reduced power requirements for high performance and adds 12-port user-configurable TTL trigger option as an important enhancement.

With additional licensing remote controlling of PacketExpert™ through multiple command-line based clients - Python and C# are supported.

For more details, refer to PacketExpert™- Multi-Functional Ethernet/IP Test Solution webpage



PacketExpert™ 1G

PacketExpert™ 1G - Portable

PacketExpert™ 1G is a portable (USB based) Quad Port Ethernet /VLAN /MPLS /IP /UDP Tester with -

- 4 Electrical Ethernet Ports (10/100/1000 Mbps)
- 2 Optical SFP Ports (100/1000 Mbps)

It can be used as a general purpose Ethernet to IP performance analysis tool for 10 Mbps, 100 Mbps and 1 Gbps Ethernet local area networks and wide area networks (WAN)

With additional licensing remote controlling of PacketExpert™ through multiple command-line based clients is available allowing access to all the aforementioned functionalities remotely via Python and C# clients and MAPS™ CLI Server.

For more details, refer to PacketExpert™ webpage

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Comparison of all PacketExpert™ Variants

PacketExpert™ 10GX	PacketExpert™ 1G
• 2x Optical 10 Gbps ports (10 Gbps BASE-SR, -LR -ER full-duplex SFP) • 2 x 100 Mbps Base-FX optical interface • 2x 2.5Gbps Electrical/Optical Interfaces. • 4x Electrical 10/100/1000 Mbps ports (Base-T Electrical) or Four 1 Gbps Optical (Base-X Optical SFP) – Includes 10 Gbps ports downshift to 1 Gbps • In 10GX platform 1G mode, – Each port can be either Electrical or Optical. – Switch between Electrical to Optical anytime	• All 4 ports can be electrical supporting 10/100/1000 Mbps Full Duplex mode • 2 of the 4 ports can be optical supporting 1000 Mbps line rate Full Duplex mode
• SMA - Optional 4-Port to 12-Port SMA Jack Trigger Board (TTL Input/Output) on the back panel 12-port enhancement supports user configurable Filter to TTL mapping	• SMA - Optional external 4-Port SMA Jack Trigger Board (TTL Input/Output) can be connected to the board
• Bus Interface - USB 3.0 Full support for USB 3.0 for higher USB data transfer speeds	• Bus Interface - USB 2.0
• Length: 8.45 in. (214.63 mm) • Width: 5.55 in. (140.97 mm) • Height: 1.60 in (40.64 mm) • Weight: 1.66 lbs. (0.75 kg)	• Length: 8.45 in. (214.63 mm) • Width: 5.55 in. (140.97 mm) • Height: 1.60 in (40.64 mm) • Weight: 1.66 lbs. (0.75 kg)

For complete list, refer to Comparison on Ethernet Testers

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PacketExpert™ 10G/1G Test Rack-mount Platform

1U Rack-mount with 3x PacketExpert™ 10GX USB Units

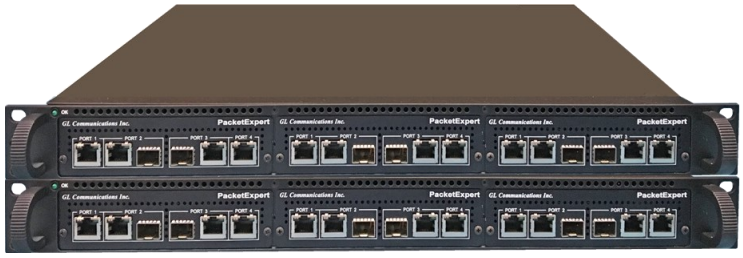
Two-stacked 1U Rack-mount with 6x PacketExpert™ 10GX USB Units (Front Panel)

PacketExpert™ 10GX Rack-mount

The rack-mount test platform is a 1U rack enclosures within which the **PacketExpert™ 10GX** USB hardware units are stacked to provide high density GigE ports form factor solution for testing GigE switches, routers and network conditions. It is a perfect ethernet test tool for customers who require multi-port testing but are constrained by lab space. It is a compact with reduced power requirements appliance for high performance and optionally can include 12-port user-configurable TTL trigger ports as an important enhancement. A single PacketExpert™ rack-mount test solution with stacked rack-mount units greatly reduces the licensing costs per device.

For more information, visit Multi-Port GigE Ethernet/IP Tester webpage

1U Rack-mount with 3x PacketExpert™ 1G USB units



Two-stacked 1U Rack-mount with 6x PacketExpert™ 1G USB units (Front Panel)

PacketExpert™ 1G Rack-mount

The rack-mount test platform is a 1U rack enclosures within which the **PacketExpert™ 1G** USB hardware units are stacked to provide high density GigE ports form factor solution for testing GigE switches, routers and network conditions. Each of the 12/24 GigE port supports auto-negotiation and flow control. The chassis comprises of both electrical and optical (fiber) interfaces. The Electrical ports can operate up to 10/100/1000 Mbps line rates in Full Duplex mode, while Optical ports can operate up to 1000 Mbps line rate in Full Duplex mode. A single PacketExpert™ rack-mount test solution with stacked rack-mount units greatly reduces the licensing costs per device.

For more information, visit Multi-Port GigE Ethernet/IP Tester webpage

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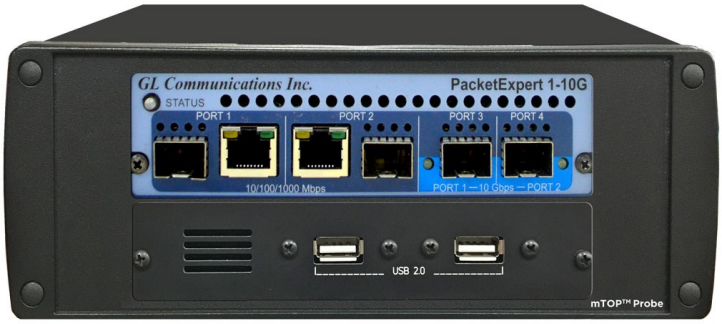
PacketExpert™ 10G/1G Test Probe Platform



PacketExpert™ 10GX Probe
(Front Panel View)

PacketExpert™ 10GX Probe

The stand-alone **PacketExpert™ 10G/1G Probe** variant includes a single USB unit along with necessary PC interfaces which makes the all-in-one self-contained test instrument portable and remote access. The comprehensive PacketExpert™ Probe hardware unit is a perfect ethernet test tool for customers who require easier portability and thus convenient for drive testing. There are no moving parts with the unit, so reliability and longevity are integral.

The Probe unit is available as Intel Core i3 or optional i7 NUC Equivalents.

For more information, visit Multi-Port GigE Ethernet/IP Tester webpage.

PacketExpert™ 1G Probe
(Front Panel View)

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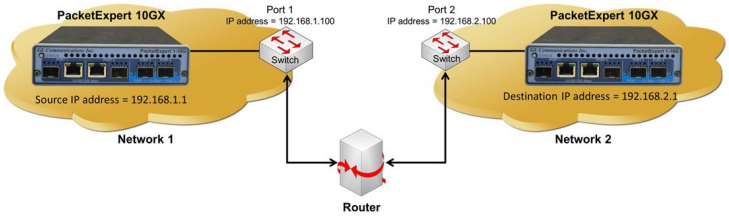
PacketExpert™ - Multiple Functionalities



Ethernet/IP 10G/1G Bit Error Rate Testing (BERT)

Wirespeed BERT Testing

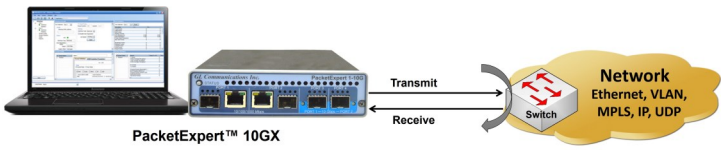
PacketExpert™ provides layer-wise wirespeed Bit Error Rate Testing (BERT) implemented at all layers – Ethernet, VLAN, MPLS, IP and UDP. BERT application allows BER Traffic generation and verification; Bit Error Insertion, FCS Error Insertion, various Pattern Types, and BERT measurements.

BERT and Loopback functionality can be accessed via various combinations, according to the testing needs:

- All ports BERT – all 4 ports run BERT (at full wire speed, simultaneous Tx and Rx) per unit
- 2 ports run BERT and the other 2 ports run in Loopback per unit

Supports generating various PRBS patterns such as 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{29}-1, and 2^{31}-1 including constant patterns such as All Ones, All Zeroes, Alternate Ones-Zeroes and user-defined test patterns ranging from 1 bit to 32 bits. Selection of optional sequence number insertion allows detecting out-of-sequence packets and packet loss.

For more information, visit Ethernet/IP 10G/1G Bit Error Rate Testing (BERT) webpage.



RFC 2544 Network Testing

RFC2544 Testing

PacketExpert™ supports Throughput, Latency, Frame Loss and Back to Back tests as specified in RFC 2544. Networks referred in RFC 2544 can be Local Area Networks (LAN) or Wide Area Networks (WAN). RFC 2544 gives testing details for different kinds of LANs Ethernet, 16 MB Token Ring, FDDI.

PacketExpert™ supports RFC 2544 test on Dual ports, test is setup such that the traffic can be generated and transmitted on either of the dual ports and the looped back traffic from the DUT is received on the opposite port validating the test parameters.

In Single port RFC 2544 test, the test is setup such that the traffic is transmitted on 10G/1G ports and the PacketExpert™ at DUT end is configured to loop the traffic back on the same port measuring the Tx and Rx time thus calculating the latency.

For more information, visit RFC 2544 Network Testing webpage.

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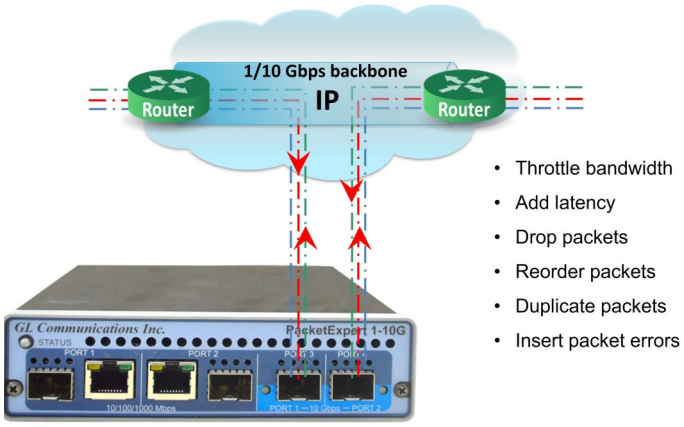
PacketExpert™ - Multiple Functionalities



WAN IP Link Emulators (IPNetSim™ and IPLinkSim™)

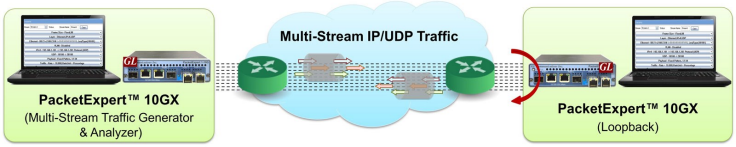
WAN IP Emulators (IPNetSim, IPLinkSim)

GL's **WAN IP Link Emulators (IPNetSim™, IPLinkSim™)** are optional applications available within PacketExpert™ 10G/1G test platforms.

IPNetSim™ emulates a bidirectional WAN IP Link with a 10 Gbps or a 10/100/1000 Mbps full duplex link. For each direction, incoming traffic can be identified into separate user defined streams (up to 16 streams for 1 Gbps pipe and up to 4 streams for 10 Gbps/2.5Gbps pipe).

IPLinkSim™ option with PacketExpert™ platform, which supports only a single stream WAN IP Link with a 10 Gbps or 10/100/1000 Mbps full duplex link, where all the incoming traffic is streamed as a single link.

For more information, visit IP WAN Emulator webpage.



Multi Stream Traffic Generator and Analyzer

Multi-stream UDP, TCP Traffic Generation and Analysis

Multi Stream UDP/TCP Traffic Generator and Analyzer is a hardware-based Ethernet tester capable of generating multi-stream Ethernet traffic of varying packet length and also analyze the loopback traffic.

- Test tool with both Ethernet traffic generation and analysis capabilities in one-box.
- Generate and analyse packets at 1GigE and 10GigE line rates, with zero packet loss.
- Generates multi-stream (16 streams on 1G, 10G and 2.5G ports) Ethernet traffic.
- The test results include Frame Loss, Frame Delay and Frame Delay Variation metrics for each stream. Easily monitor the bandwidth performance using live throughput consolidated graphical view for all the configured streams.

For more information, visit Multi Stream Traffic Generator and Analyzer webpage

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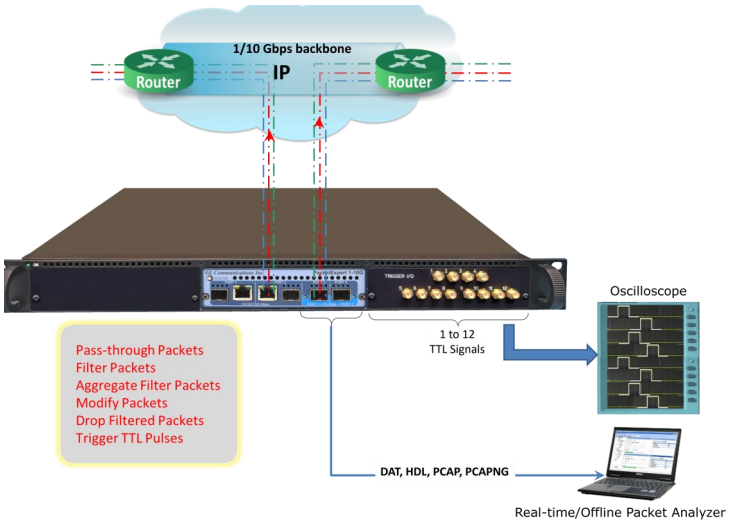
PacketExpert™ - Multiple Functionalities



PacketBroker – Passive Ethernet Tap

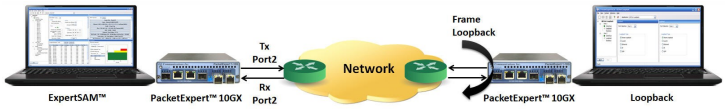
PacketBroker™ - Passive Ethernet Tap

PacketBroker is an optional application added to GL's PacketExpert™ platforms, that allows the Ethernet test tool to be used as a highly precise non-intrusive Wirespeed Ethernet Tap with all the necessary features packaged within to capture real world traffic.

The PacketBroker application utilizes all the ports available on the hardware to support advanced features such as -

- Network Tap - capable of handling bidirectional 100% wirespeed traffic up to 10 Gbps
- Wirespeed Filtering - powerful and easy to use
- Packet Modification to convey useful information like Timestamp, Filter number etc. inband
- TTL Trigger I/O - generates or accept TTL signals based on packet filters
- Output aggregation - both direction traffic multiplexed on the same output port
- Record the output to a file for offline analysis.

For more information, visit PacketBroker – Passive Ethernet Tap webpage



PacketExpert™ - ExpertSAM™ (ITU-T Y.1564)

ExpertSAM™ - ITU-T Y.1564

ExpertSAM™ is an optional application with GL's PacketExpert™, Ethernet /IP Tester.

ExpertSAM™ is intended for multiservice testing to measure the maximum performance of the Device or the Network under Test. ExpertSAM™ is a set of procedures that test the ability of Ethernet-based services to carry a variety of traffic (voice, data, and video) at defined performance levels. In particular, it is aimed at addressing limitations of legacy RFC 2544 test procedures, especially for Service Level Agreements (SLA).

ExpertSAM™ is a single test conducted to validate SLAs as per ITU-T Y.1564 standard. The ITU-T Y.1564 is built around two key subtests, the Service Configuration Test and the Service Performance Test.

For more information, visit PacketExpert™ - ExpertSAM™ (ITU-T Y.1564) webpage

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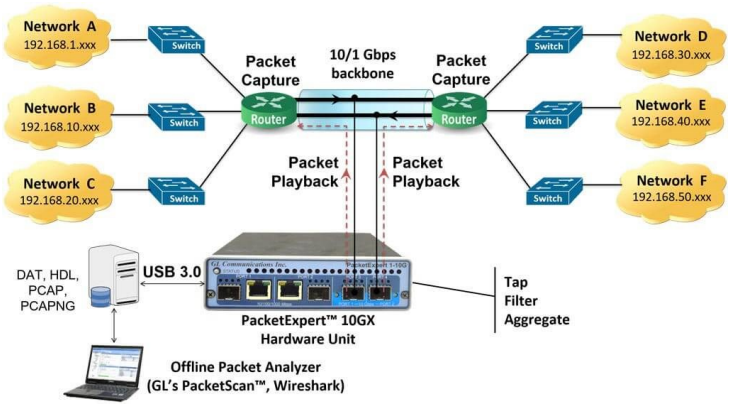
PacketExpert™ - Multiple Functionalities



Wirespeed Ethernet Packet Capture and Playback

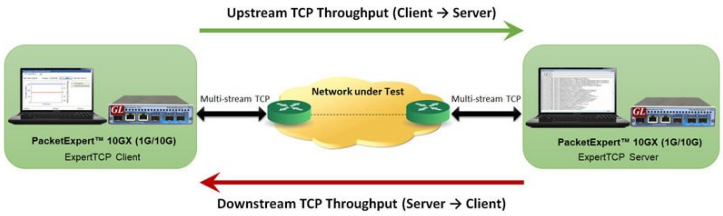
Wirespeed Ethernet Packet Capture and Playback

Wirespeed Capture and Playback testing is an optional application within PacketExpert™ 10GX platform. Record Playback module is a Wirespeed Ethernet Tap, which works as a High-Precision Wirespeed Traffic Generator in optical interfaces supporting up to 10 Gb/s. It supports all the features of high-end taps in a portable unit providing Wirespeed Packet Capture, Filter, Aggregate, & Storage (for offline analysis) over both 10G and 1G ports.

The Record and Playback module allow users to use PacketExpert™ for

- Continuous Simultaneous Capture and Playback over Multiple Ports.
- High Precision Wirespeed Ethernet Packet Forwarding
- High Precision Wirespeed Ethernet Packet Capture

For more information, visit Wirespeed Ethernet Packet Capture and Playback webpage



ExpertTCP™ - TCP Throughput Testing (RFC 6349)

ExpertTCP™ - TCP Throughput Testing (RFC 6349)

ExpertTCP™ is an optional application with GL's PacketExpert™, Ethernet/IP Networks Test platform.

ExpertTCP™ test methodology is based on the RFC 6349 to measure TCP Throughput, RTT and optimal window size. It has the capability to Generate and Analyze up to 8 TCP streams of traffic on 1G platform, and up to 16 TCP streams of traffic on 10G platform of varying packet lengths.

It also performs bi-directional TCP throughput measurements in combination with another unit at the remote location (other end of the network), that acts as the TCP server, as depicted in the figure above. Many real-world networks are not symmetrical. There may be significant differences between upstream and downstream directions. ExpertTCP™ supports both Upstream (Client → Server) and Downstream (Server → Client) direction testing.

For more information, visit ExpertTCP™ - TCP Throughput Testing webpage.

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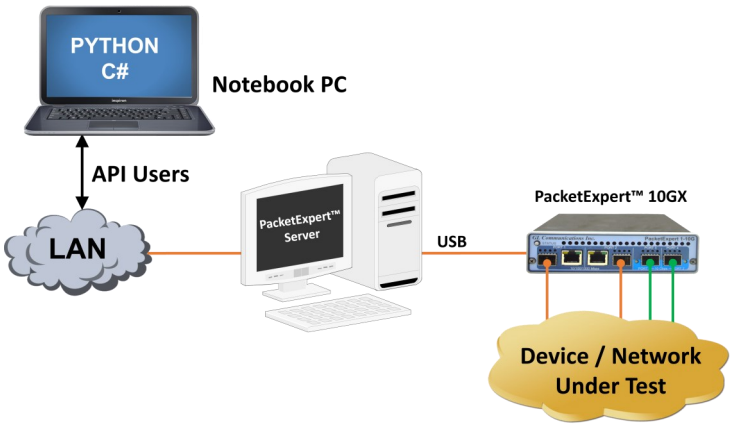
PacketExpert™ - CLI/APIs Support



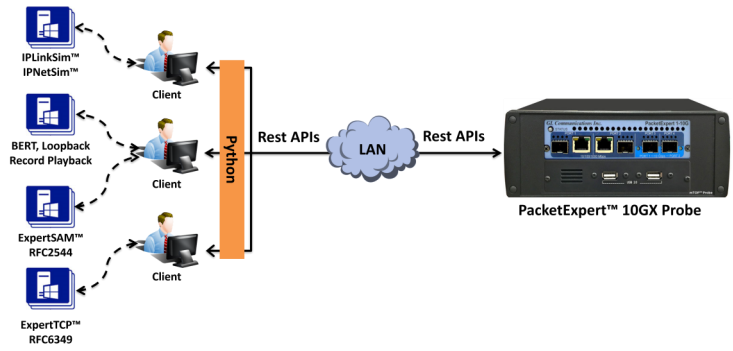
CLI/APIs for Test Automation and Remote Access

CLI/APIs for Test Automation and Remote Access

With additional licensing, PacketExpert™ supports Command line Interface (CLI) to access all the functionalities remotely such as Bert, Loopback, RFC 2544, Record Playback, IPNetSim™, ExpertSAM™, PacketBroker, and Multi Stream Traffic Generator and Analyzer using Python and C# client APIs and MAPS™ CLI Client/Server architecture.

- Capability of remote operation, automation and multi-site connectivity using Python/C# client and MAPS™ CLI server.
- Scripts for MAC, VLAN, MPLS, IP and UDP layers testing
- Multiple PacketExpert™ can be controlled remotely from single client application via MAPS™ CLI server.

For more information, visit PacketExpert™ APIs for Test Automation and Remote Access webpage.



Remote Access via REST APIs

Remote Access via REST APIs

The Probe with PacketExpert™ USB hardware and Web server running on the NUC mini PC acts as REST Web Service Server. Command line Interface (CLI) support allows remote controlling using Python client.

Web service uses REST APIs which are based on URLs and the HTTP protocol and use browser compatible JSON for a data format. The clients directly communicate with the server and controls PacketExpert™ Probe using high-level REST APIs. APIs uses HTTP requests to GET, PUT, POST and DELETE data. Web server receives the HTTP requests from clients and executes the tasks as per the request and sends back the response to the client in JSON format.

Different clients (Python) can connect to single PacketExpert™ Probe (Web server) to run any functions (BERT, Loopback, RFC2544, Record Playback, WAN Emulation, Multi-stream Traffic Generation and Analysis), using the REST APIs, permitting complex real-time test scenarios.

For more information, visit Multi-Port GigE Ethernet/IP Tester webpage.

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