IP WAN Link Emulator - IPLinkSim™- 1G/10G/2.5Gbps

Single Stream IP WAN Link Emulator

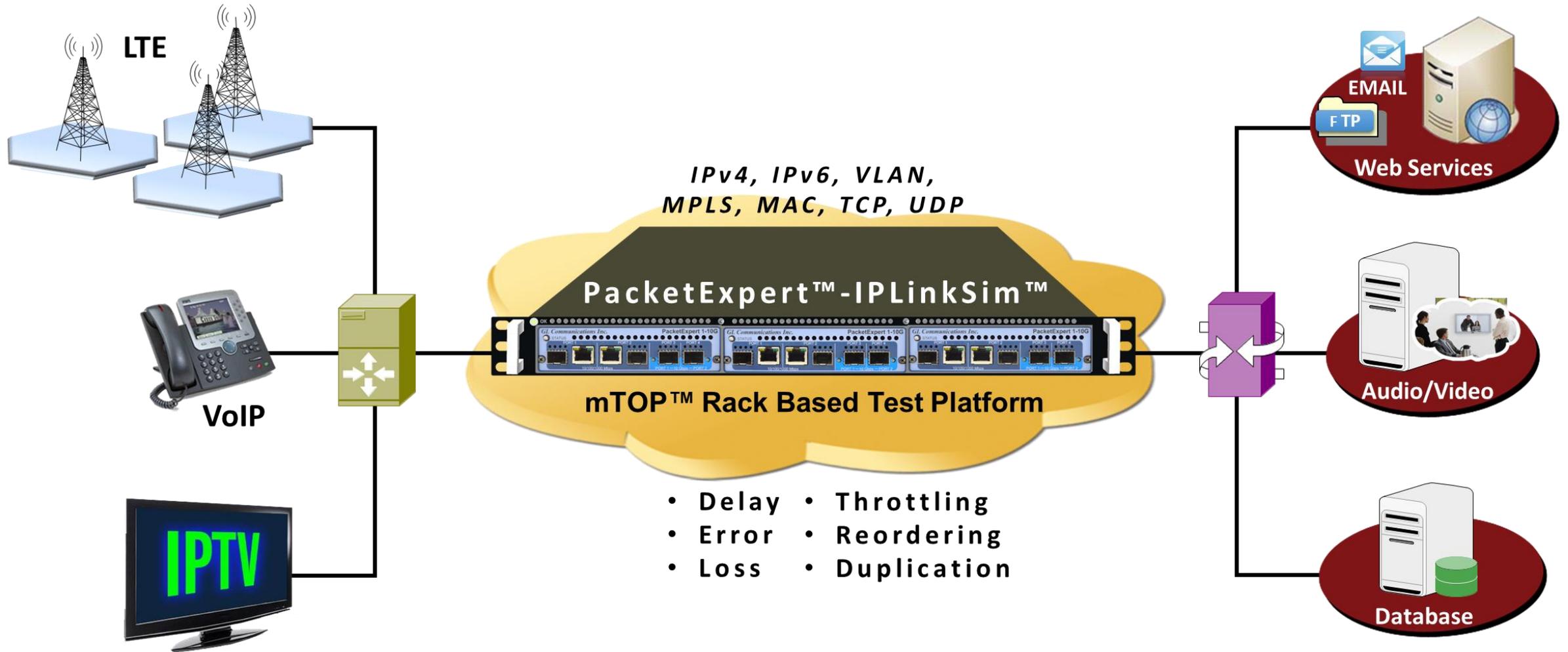**◈GL Communications Inc.**

IP WAN Link Emulator

LTE

VoIP

IPTV

IPv4, IPv6, VLAN,
MPLS, MAC, TCP, UDP

PacketExpert™-IPLinkSim™

mTOP™ Rack Based Test Platform

- Delay
- Error
- Loss
- Throttling
- Reordering
- Duplication
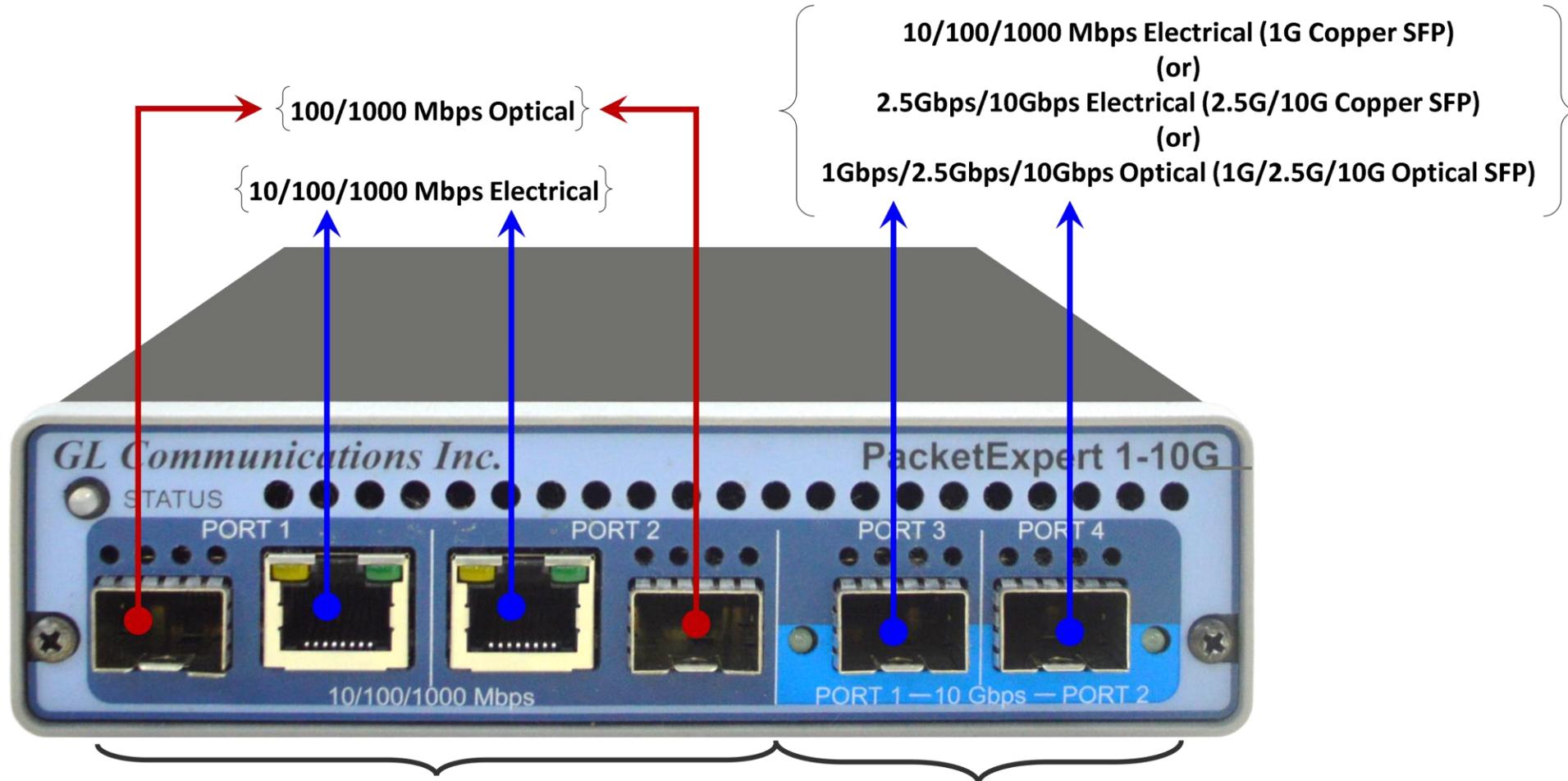
EMAIL

FTP

Web Services

Audio/Video

Database

Features

- Easy-to-use portable hardware based WAN Link Emulator

- Emulates 1 bi-directional WAN link per IPLinkSim™ unit (port 2 <-> port 3). With high density IPLinkSim™ up to 6 WAN links emulation per unit is possible

- Supported on both Electrical (10 /100/1000 Mbps) and Optical (1000 Mbps) interfaces

- Emulate WAN link conditions separately and independently for each direction. Acts as a transparent bidirectional link or a simple Ethernet Bridge for easy integration with any test setup

- Easily monitor the bandwidth performance using live throughput graphs (up to 7 days), and per-port or per-link statistics

- Introduce bi-directional impairments independently on each port

- Remote access and automation through Python, C# and MAPS CLI client/server architecture

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Features (Contd.)

- Bandwidth control (300 bps up to 1000 Mbps) to emulate various WAN link speeds (Modem, DSL, T1/E1/T3/E3/OC3/OC12 etc.)

- Supports transmission of Ethernet Pause frame with user-defined quanta used to throttle Ethernet link overload

- Check the stability or performance of the network with various real-world impairments:

  - Bandwidth control (300 bps up to 1000 Mbps)

  - Latency/Delay (100 microseconds to 4000 milliseconds (for 1Gbps) and 2000 milliseconds (for 10/2.5 Gbps))

  - Packet Loss (loss rate % of total packets 0–100%)

  - Packet Reordering (reordering rate (0-100%) with Min and Max Delay range)

  - Packet Duplication (percentage of total packets duplicated 0 - 100%)

  - Logic Error and FCS Error insertion (10^{-1} to 10^{-9} error rate)

Portable Unit

10/100/1000 Mbps Electrical (1G Copper SFP)
(or)
2.5Gbps/10Gbps Electrical (2.5G/10G Copper SFP)
(or)
1Gbps/2.5Gbps/10Gbps Optical (1G/2.5G/10G Optical SFP)

100/1000 Mbps Optical

10/100/1000 Mbps Electrical

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PacketExpert 1-10G

STATUS

PORT 1   PORT 2   PORT 3   PORT 4

10/100/1000 Mbps   PORT 1 — 10 Gbps — PORT 2

Port#1 and Port#2
10/100/1000Mbps Electrical *(Or)*
100/1000Mbps Optical Ports

Port#3 and Port#4
10/100/1000Mbps Electrical *(Or)* **1G Optical Ports**
(Or)

Port#1 and Port#2   *(Or)*   **Port#1 and Port#2**
10G Optical Ports   **2.5G Electrical/Optical Ports**

PacketExpert™ 10GX - Portable Unit
(PXN100, PXN101)

RJ45/SFP   **RJ45/SFP**   **SFP+**   **SFP+**

Physical Specifications	• Length: 8.45 in (214.63 mm) • Width: 5.55 in (140.97 mm) • Height: 1.60 in (40.64 mm) • Weight: 1.713 lbs
External Power Supply	• +12 Volts (Medical Grade), 3 Amps (For portable units having serial number ≥ 188400) • +9 Volts, 2 Amps (For portable units having serial number < 188400)
BUS Interface	• USB 3.0 • Optional 4-Port SMA Jack Trigger Board(TTL Input/Output)
Protocols	• IEEE 802.3ae LAN PHY compliance • RFC 2544 compliance

1U Rack Option

Front Panel

100/1000 Mbps Optical

10/100/1000 Mbps Electrical

10/100/1000 Mbps Electrical
OR
2.5 Gbps/10 Gbps Electrical
OR
1 Gbps/2.5 Gbps/10 Gbps Optical

Back Panel

Power
(100-240 AC Supply)

On/Off Switch

USB 3.0 Port

USB Type C Ports

HDMI Port

Ethernet Port

USB 2.0 & USB 3.0 Ports

Reset
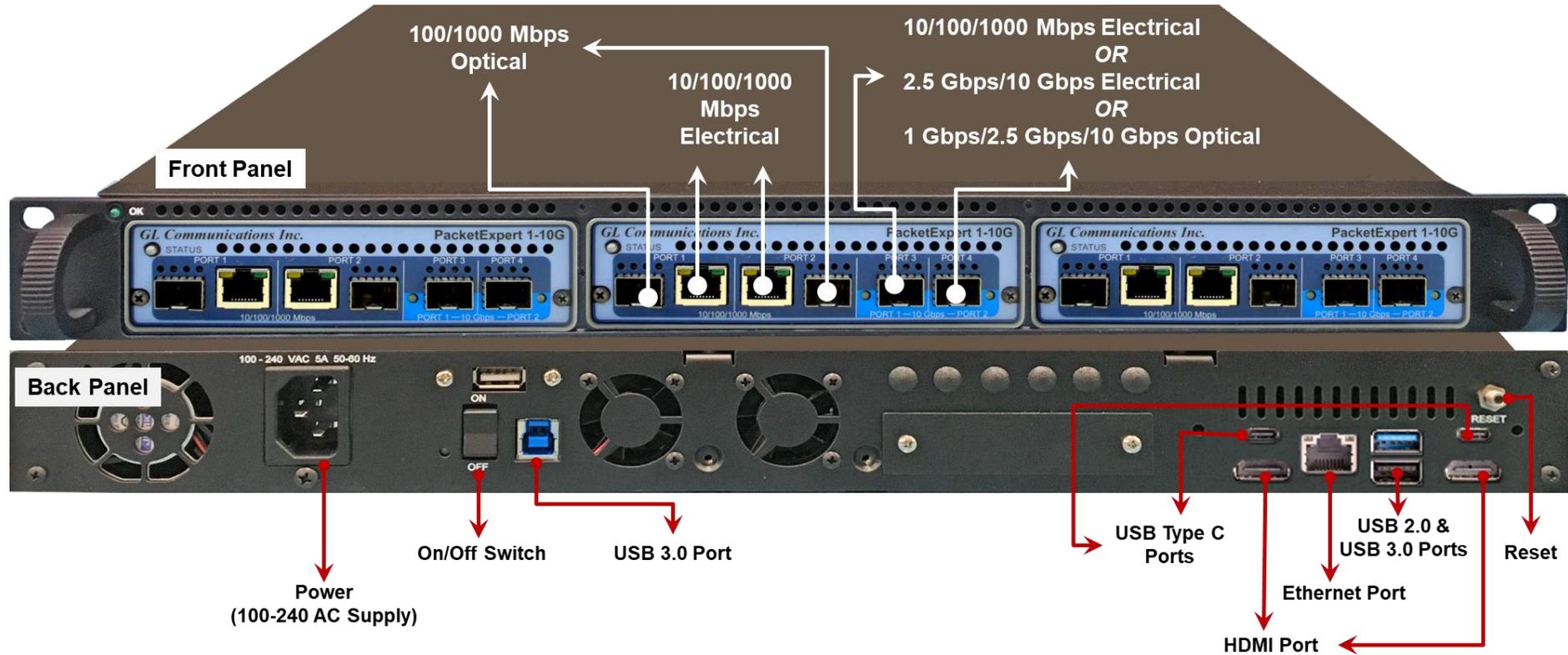
MTOP™ Rack Units

High Density 1U Rack option
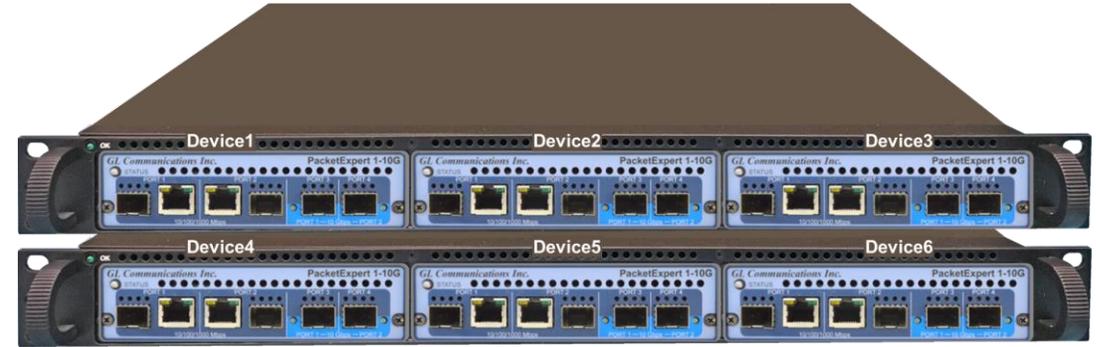
Stacked High Density 1U Rack option

Physical Specifications	• Length: 16 in (406.4) • Width: 19 in (482.6) • Height: 1U / 2U
External Power Supply	• ATX Power Supply

BUS Interface	• 1U mTOP™ (MT001 + 3x PXN100)
	   ➤ Rackmount Enclosure can support up to 3 PXN100s
	• 2U Rack Mount (with 6x PXN100)
	   ➤ Rackmount Enclosure can support up to 6 PXN100s
	• Optional 4 to 12 Port SMA Jack Trigger Board (TTL Input/Output)

SBC Specifications	• Intel Core i3 or optional i7 NUC Equivalent, • Windows® 11 64-bit Pro Operating System • USB 3.0 and USB 2.0 Ports • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports

mTOP™ Probe with 10GX Hardware Unit + SBC

Physical Specifications	• Length: 10.4 in. (264.16 mm) • Width: 8.4 in. (213.36 mm) • Height: 3.0 in. (76.2 mm) • Optional 4-Port SMA Jack Trigger Board (TTL Input/Output) • External USB based Wi-Fi adaptor
External Power Supply	• +12 Volts (Medical Grade), 3 Amps
SBC Specifications	• Intel Core i3 or optional i7 NUC Equivalent, • Windows® 11 64-bit Pro Operating System • USB 3.0 and USB 2.0 Ports • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports

Software Specification

WAN Emulation Parameters

- Bandwidth control - 10 Kbps up to 1000 Mbps

- Latency/Delay

  ➢ 0 milliseconds to 8 seconds (8000 milliseconds) (for 1G/10 Gbps link)

  ➢ single delay, uniform, random distributions

- Packet Loss Rate - 0–50%

- Packet Reordering Rate - 0-50% with Delay range of up to 8 seconds

- Packet Duplication Rate - 0 - 50%

- Logic Error Insertion Rate - 10^{-1} to 10^{-9}

- FCS Error insertion Rate - 10^{-1} to 10^{-9}

Optical Connectors and SFP Transceivers

LC Connectors
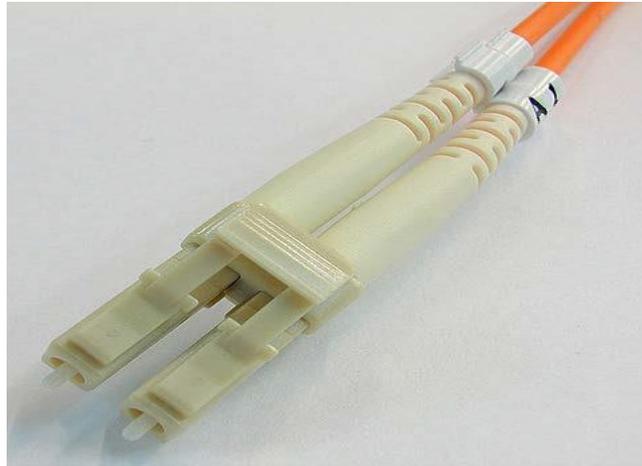
850nm/1310nm/1550nm SFP Module

- PacketExpert™ supports LC connectors and 850nm/1310nm/1550nm SFP (Small Factor Pluggable) modules

Note: In case customer have different type of connectors, then we need converters like LC-to-SC, LC-to-FC and vice-versa.

Applications

- Emulate WAN links to estimate the optimum link bandwidth

- Use IPLinkSim™ to find out if equipment upgrade improves performance

- Pinpoint problems and validate solutions prior to network deployment

- Test the working of client/server applications at remote locations

- Verify the responsiveness of your website and e-commerce systems.

- Verify quality requirements to deploy VoIP in real-world conditions.

- With the High-density IPLinkSim™ (supports up to 6 WAN links) directly compare and demonstrate application performance on multiple independent WAN links

Who uses the IPLinkSim™?

- IPLinkSim™ is designed for anyone who needs an accurate, easy-to-use, cost-effective way to simulate WAN IP Link conditions, including:

  ➢ Application and equipment developers

  ➢ Networking equipment resellers and system integrators

  ➢ Quality Assurance teams and Test labs

Connecting IPLinkSim™
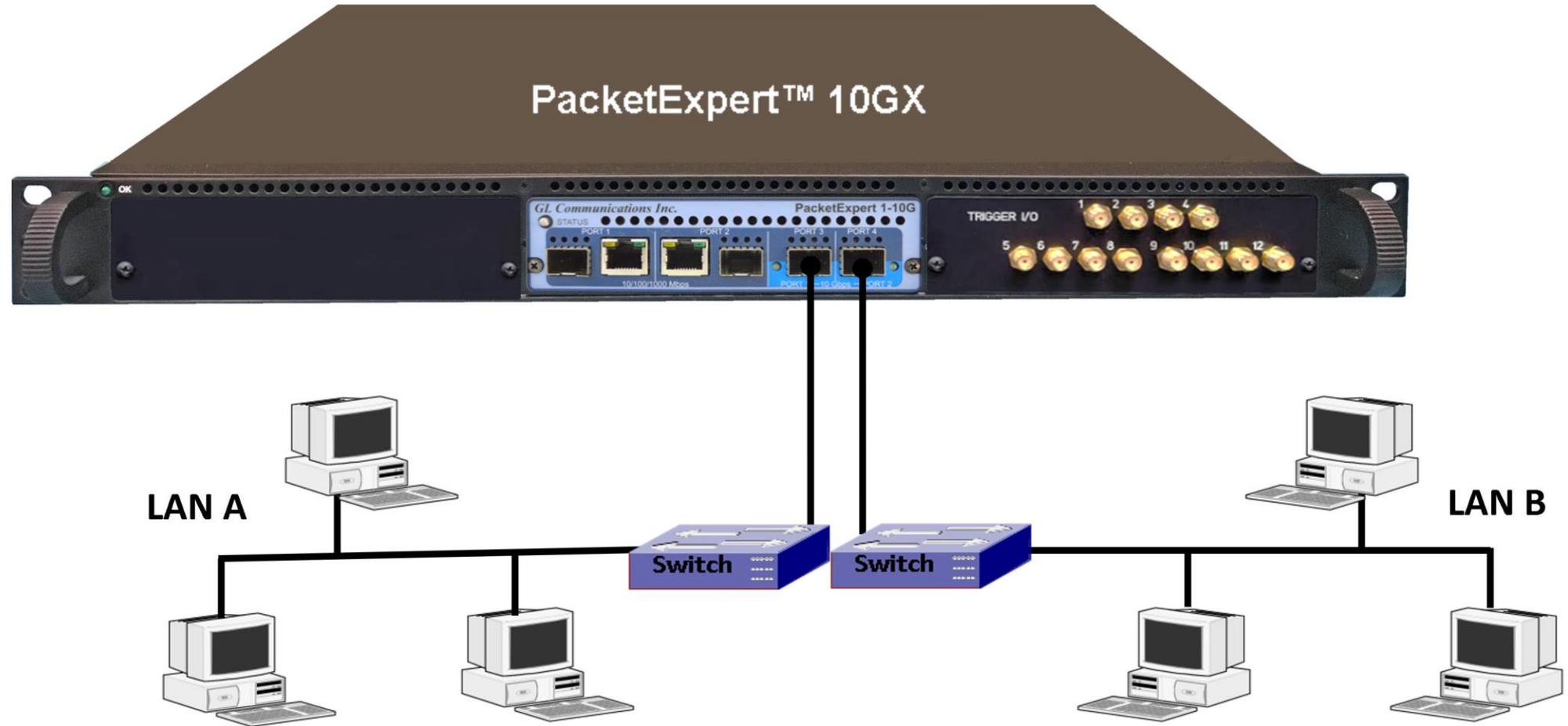
Since IPLinkSim™ acts as a transparent bi-directional link, it can be connected wherever an Ethernet link or a simple bridge can be connected. The configurable link emulation conditions includes Bandwidth Control, Latency, and Error Insertion

Easy-to-use Interface

- IPLinkSim™ is an important and simple to use tool that simulates IP WAN links using a portable hardware unit

- It features an easy-to-use interface to quickly get started with testing WAN and applications in real-time

Link Emulation

IPLinkSim™-Single Bi-directional Link

LAN A → P1 → BW Control → Latency → Drop/Reorder/Duplication/Jitter → Error Insertion → P2 → LAN B (LAN A -> LAN B)

LAN A ← P2 ← Error Insertion ← Drop/Reorder/Duplication/Jitter ← Latency ← BW Control ← P1 ← LAN B (LAN A <- LAN B)

- Emulates a bi-directional WAN link between the ports 2 and 3

- Each direction acts as a separate and independent WAN Link

- Each link can be configured independently for all the link emulation characteristics

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Traffic Bandwidth

- Used to emulate various WAN links (Modem, DSL, T1, E1, T3, E3, OC-3/STM-1, OC-12/STM-4 etc) of varying speeds 10 Mbps to 10 Gbps

- On the 1G ports, the unit supports simulation of 1 bidirectional WAN link, with 1 Gbps in each direction to an aggregate of 2 Gbps

Latency

- Latency/Delay to emulate various wired, wireless, and network elements

  ➢ Single Delay

  ➢ Uniform Distributions

  ➢ Random Distributions

Packet Loss

- Packet Loss can be introduced either Automatically (as a Rate) or Manually.

- For both automatic and manual, user can choose to drop a single packet or a burst of packets, at a time

  - **Rate**: User can configure the Loss rate, and packets will be dropped at that rate

  - **Manual Drop**: This allows user to manually drop either a single packet or burst of packets at run time

  - **Periodic vs Random Drop**: In the case of Periodic drop, the packets chosen for dropping remain constant and predictable. However, in real-world scenarios, Packet Drop is unpredictable as it occurs randomly. To help emulate true real-life Packet loss, option for "Random Packet Loss" can be used.'

Packet Reordering

- Packet reordering model includes Periodic and Random Packet Reordering options

- In **Periodic option**, the packets are reordered at constant specified rate

- While in **Random option**, packets are randomized for reordering, but still maintain the specified Reorder rate

Packet Duplication

- Packet Duplication model also includes Periodic and Random Packet Duplication options

- In **Periodic Duplication** option, the packets are duplicated at specified rate periodically

- In **Random Duplication** option, the selected packet is duplicated (based on the rate) randomly but maintaining the duplication rate

Logic Error Insertion

- In **Periodic Error Insertion** option, the start of frame and end of frame byte offsets specifies where exactly in the frame to inject errors

- In the **Random Error Insertion** option, the packet will be randomly selected for error insertion (based on the rate), but the error insertion rate is maintained

- But in Manual Error Insertion option, error is introduced into a single packet at run time manually

FCS Error Insertion

- FCS (Frame Check Sequence) is the extra checksum characters added to a frame for error detection.

- This option is used to emulate the errors normally caused interference or incompatible device, or by edge devices such as gateways, where FCS can be recomputed. Here, the FCS bytes within the frames are corrupted.

- FCS Error can be inserted **Automatically** or **Manually**

Link Statistics

| Statistics	Value P1->P2	Percent P1->P2	Value P2->P1	Percent P2->P1
TxBytes	320 048 205 480	NA	320 059 352 154	NA
10 Sec Average Throughput	989.830	NA	989.849	NA
1 Min Average Throughput	989.831	NA	989.847	NA
10 Min Average Throughput	989.831		989.847	
		NA		NA
RxFrames	210 834 686	NA	210 842 030	NA
TxFrames	210 835 062		210 842 405	
		NA		NA
Dropped Frames(Bandwidth Control)	0	0.000	0	0.000
Dropped Packets (Packet Loss)	0	0.000	0	0.000
Reordered Packets	0	0.000	0	0.000
Duplicated Packets	0	0.000	0	0.000
No of Packets With Errors	0	0.000	0	0.000
Inserted Bursts for BKG Traffic	0.00 bps	NA	0.00 bps	NA
No of Packets With FCS Errors	0	0.000	2	0.000

- It provides real-time transmission statistics of the traffic over the emulated link (P1-P2)/(P2-P1) for each direction
- The statistics parameters includes Dropped Frames (Bandwidth Control), No. of Packets with Errors, Dropped Packets (Packet Loss), Duplicated Packets, Reordered Packets, and Traffic Bandwidth, for varying durations

Port Statistics

Port Statistics

Port Selection Port 2 ▼   Reset

Description	Tx	Rx
Total Frames	1 242 533 879	1 243 070 654
Valid Frames	1 242 533 879	1 243 070 654
Bad Frames	0	0
Number of Bytes	79 522 168 256	79 556 521 856
Link Utilisation(%)	0.000	0.000
Data Rate(Mbps)	0.000	0.000
Frame Rate(Frames/sec)	0	0
Non Test Frames	0	0
Broadcast Frames	0	0
Multicast Frames	0	0
Control Frames	0	0
VLAN Frames	0	0
Pause Frames	0	0
Wrong Opcode Frames	0	0
Out of Bound Frames	0	0
Length Type Out of Range Frames	0	0
64 Byte Length Frames	1 242 533 879	1 243 070 654
65-127 Byte Length Frames	0	0
128-255 Byte Length Frames	0	0
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	0	0
1024-1518 Byte Length Frames	0	0
Oversized Frames	0	0
Undersized Frames	-	0
FCS Error Frames	-	0
1 Level Stacked VLAN Frames	-	0
2 Level Stacked VLAN Frames	-	0
3 Level Stacked VLAN Frames	-	0
1 Level Stacked MPLS Frames	-	0
2 Level Stacked MPLS Frames	-	0
3 Level Stacked MPLS Frames	-	0
IP Checksum Errors	-	0
IPv4 Packets	-	1 243 070 654
IPv6 Packets	-	0
IP in IP Packets	-	0
UDP in IP Packets	-	1 243 070 654
TCP in IP Packets	-	0
ICMP in IP Packets	-	0
IGMP in IP Packets	-	0
IGRP in IP Packets	-	0
Other Protocol in IP Packets	-	0
UDP Checksum Errors	-	0
UDP Packets	-	1 243 070 654

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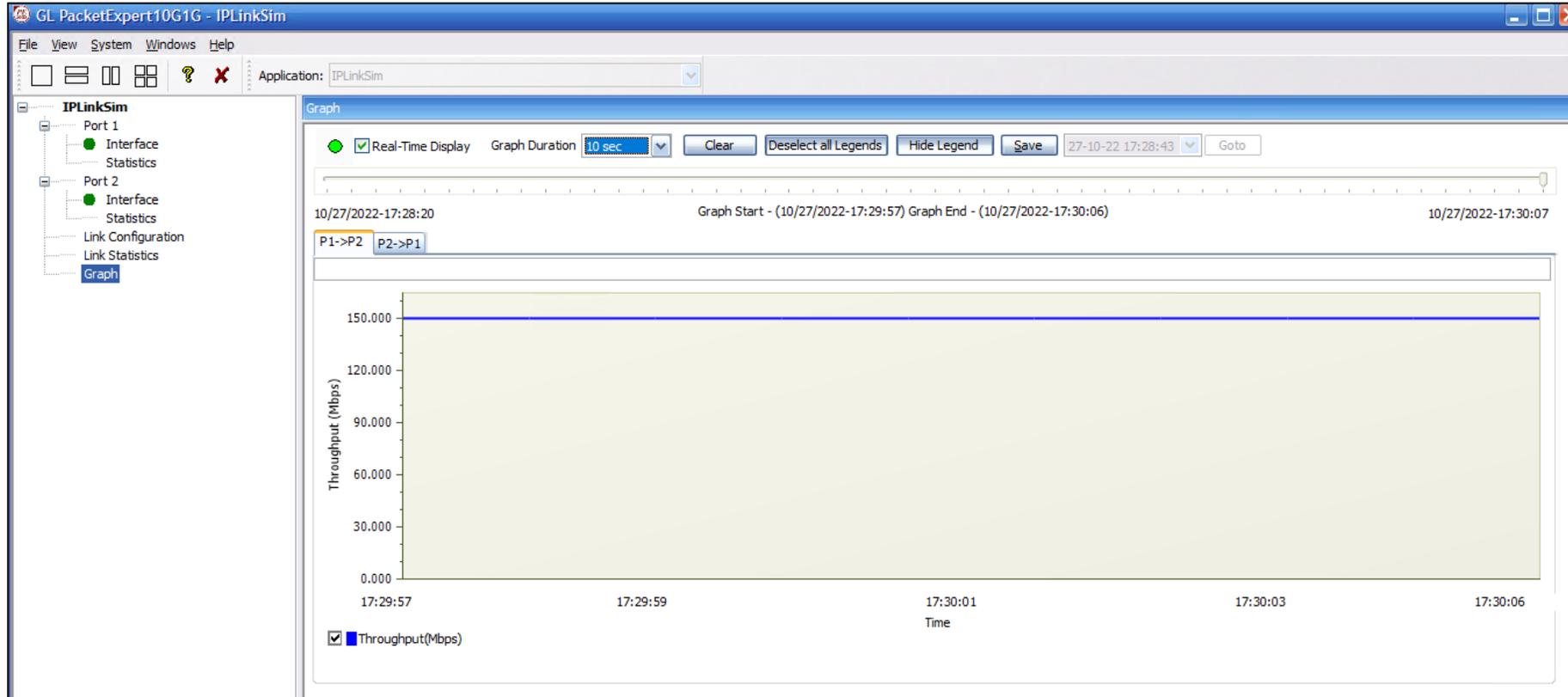
Throughput Graph

- A real time display of Throughput of the link, plotted as the rate against time, in the form of a line graph. The Graph can be viewed for a single link or both the links together

Thank you