

# IPLinkSim™ - 10G/1G (IP WAN Single Stream Emulator)



## Overview

Generally the applications intended to work on different networks such as enterprise networks, storage, cloud services, web services, ftp, audio/video streaming, require testing with the realistic network conditions prior to live deployment. **WAN Link Emulators** help test the performance of such network-dependent applications by generating real-time impairments.

**IPLinkSim™** (IPN511) application emulates a real-world WAN link with features such as bandwidth throttling, congestion emulation, latency, packet loss, packet duplication, dropped packets, packet corruption etc. Bandwidth Throttling mimics slower WAN links like RS232/DSL/Modem/T1/E1/T3/E3 etc. This feature allows testing applications running in PCs, which normally have higher capability interface but access to the outside internet or intranet over WAN is very slow.

IPLinkSim™ 1G/10G is a 19" 1U Rackmount Enclosure w/ Embedded Single Board Computer (SBC) and requires IPN511 licenses to support 1G and 10G WAN links emulation.

**IPLinkSim™** appliance comprises of 4 ports, of which 2 ports support 10/100/1000 Mbps in either Electrical or Optical mode, emulating a 1Gbps full duplex pipe. The optical mode supports only 1000 Mbps using SFPs enabling testing on optical fiber. The other two ports on the unit support 10Gbps using 10 Gbps SFP+s.

IPLinkSim™ acts as a transparent bidirectional link or a simple Ethernet Bridge between 2 LANs and test the network with various real world impairments such as Constant Delay, Delay variation (Jitter), Congestion, Packet Loss/Duplication/reordering, Logic, and FCS error. It also includes live throughput graphs, and per-port or per-link statistics log for easy performance monitoring.

For more details, refer to <http://www.gl.com/wan-link-emulation-iplinksim.html>

1U Rack Hardware based WAN Link Emulator

Emulates Single Bi-directional WAN Stream per Hardware Unit

Network Impairments: Latency, FCS & Logic Error, Packet Loss, Duplication, Reordering

Automated and Manual Packet Impairment Features

Emulate Various Types of WAN Links (T1/E1/T3/E3/OC3/OC-2, DSL, Modem, etc.)

Introduce Bi-directional Delay in Milliseconds Increment

Background Traffic Simulates Competing Application Traffic

Dual Optical SFP Ports of 10Gbps or Dual Electrical/Optical Ports of 1000 Mbps

Statistics for Tx/Rx Traffic Through All Links

Command Line Interface for Automated Testing and Remote Accessibility



**GL Communications Inc.**

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A

(Web) <http://www.gl.com/> - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) [gl-info@gl.com](mailto:gl-info@gl.com)

## Features

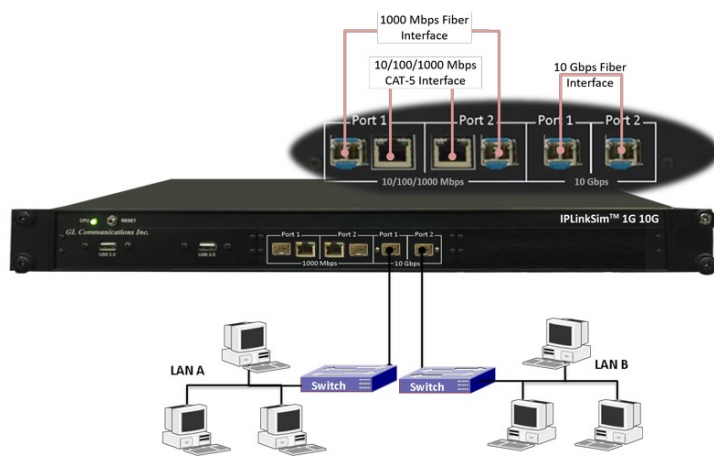
Network Interfaces and Standards	<ul style="list-style-type: none"> <li>• 1U rack mount hardware based single stream (a link) IP WAN link emulator.</li> <li>• Each IPLinkSim™ appliance comprises of dual optical only interface supporting 10Gbps using SFP+s and also dual electrical or optical interfaces, supporting 10/100/1000 Mbps and optical ports supporting 1000 Mbps using SFP.</li> </ul>
WAN Emulation	<ul style="list-style-type: none"> <li>• Acts as a transparent bi-directional link or a simple Ethernet Bridge for easy integration with any test setup.</li> <li>• Emulates 1 bi-directional (2 ports) WAN Link per unit.</li> <li>• Emulates WAN conditions separately and independently for bidirectional link</li> <li>• Check the stability or performance of the network with various real world impairments including Constant Delay, Delay variation (Jitter), Congestion emulation, Packet Loss/Duplication/reordering, and Error Insertion.</li> <li>• Supports Periodic and Random Packet Loss, Packet Reordering, Packet Duplication and Error Insertion impairments</li> <li>• Burst Packet Loss type to emulate real-world impairment conditions</li> <li>• Manual Packet Drop, Reorder, Duplication and Error Insertion impairments at run-time.</li> <li>• Bandwidth control to emulate various WAN link speeds</li> <li>• Introduce bi-directional delay in milliseconds increments</li> <li>• Supports transmission of Ethernet pause frames with user defined quanta used to throttle Ethernet link overload</li> </ul>
Statistics	<ul style="list-style-type: none"> <li>• Easily monitor the bandwidth performance using live throughput graphs, and per-port or per-link statistics</li> <li>• Detailed per link statistics for bi-directional link.</li> <li>• Provides per port frame statistics like Total Frames/Bytes Received, Rx Frame Rate, Rx Data Rate, etc.</li> </ul>

## Working Principle

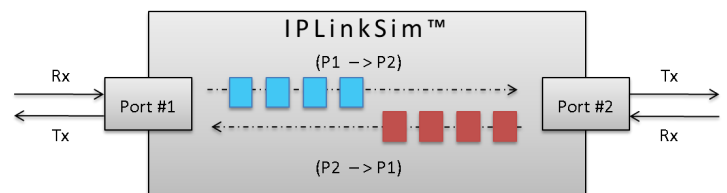
By default, IPLinkSim™ does not introduce any impairments, and acts as a transparent bidirectional Ethernet link or a simple Ethernet bridge between 2 Ethernet end points. The links are emulated between Port 1 (P1) and Port 2 (P2).

P1 -> P2 is one link and in the reverse direction, i.e., P2 -> P1 forms the other link. By default, P1 and P2 work in pass-through mode, and pass all frames across to the other port. Frames arriving at P1 are carried over to P2 and frames arriving at P2 are carried to P1.

On each direction, you can choose to simulate the different link impairments (such as Bandwidth Control, Background Traffic, Latency, Error Insertion, Packet Loss, Duplication, and Dropped packets) emulating the real-world scenarios.



IPLinkSim™ (WAN Emulator) connecting LAN 1 and LAN 2



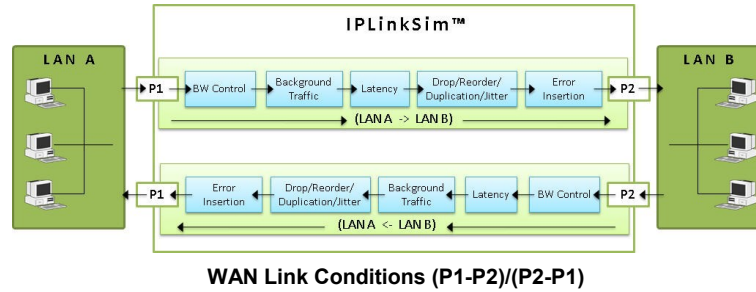
Bidirectional Link (P1-P2)/(P2-P1)



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## Simulating WAN Link Conditions

Link Emulation configuration option includes various parameters settings such as Bandwidth, Latency, Packet-Loss, Logic Error Insertion, FCS Error Insertion, Background Traffic, Packet Reordering, and Duplication, for the selected WAN link (P1-P2)/(P2-P1).



Parameters	P1 -> P2	P1 -> P2 Manual	P2 -> P1	P2 -> P1 Manual
Traffic Bandwidth	1000.00 Mbps		10000.00 Mbps	
Background Traffic Bandwidth	25.00 %, 10000 bytes		50.00 %, 100000 bytes	
Latency	Single Delay, 10 ms		Uniform, 0 - 2000 ms	
Packet Loss	10.00 %	Drop	20.00 %	Drop
Packet Reordering	1 out of 10 packets	Reorder	1 out of 20 packets	Reorder
Packet Duplication	10.00 %	Duplicate	20.00 %	Duplicate
Logic Error Insertion	10 <sup>-1</sup>	Insert	10 <sup>-3</sup>	Insert
FCS Error Insertion	10 <sup>-2</sup>		10 <sup>-5</sup>	

P1 -> P2

FCS Error Insertion

Error Rate: 10<sup>-2</sup>

P2 -> P1

FCS Error Insertion

Error Rate: 10<sup>-5</sup>

Bandwidth control	<ul style="list-style-type: none"> <li>1G - varying rates from 10 Kbps to 1000 Mbps</li> <li>10G - varying rates from 10 Kbps to 10 Gbps</li> </ul>
Latency/Delay	<ul style="list-style-type: none"> <li>Value ranges from 0 milliseconds to 8 seconds (8000 msec)</li> <li>single delay, uniform, random distributions</li> </ul>
Background Traffic	<ul style="list-style-type: none"> <li>% of total rate with bursty traffic</li> <li>Data size value in bytes to represent the average size of the background traffic burst from 64 – 1,000,000 bytes</li> </ul>
Packet Loss	<ul style="list-style-type: none"> <li>Rate Packet Loss - Periodic or Random packet loss at specified rate. Single or Burst of Packet drop at a time.</li> <li>Manual Packet Loss - Manual packet loss maintaining the specified rate. Single or Burst of Packet drop at a time.</li> <li>loss rate % of total packets 0–100%</li> <li>Minimum and Maximum burst size (in terms of packets)</li> </ul>
Packet Reordering	<ul style="list-style-type: none"> <li>Automated Packet Reordering - Periodic or Random packet reorder at specified delay offset</li> <li>Manual Packet Reordering - Manual packet reorder maintaining the specified delay offset</li> <li>Reordering rate (0-100%) with Min &amp; Max (up to 2 secs) time Delay offset and minimum and maximum packet offset</li> </ul>
Packet Duplication	<ul style="list-style-type: none"> <li>Rate Packet Duplication - Periodic or Random packet duplication at specified rate</li> <li>Manual Packet Duplication - Manual packet duplication maintaining the specified rate</li> <li>Percentage of total packets duplicated (0 - 100%)</li> </ul>
Error Insertion	<ul style="list-style-type: none"> <li>Rate Error Insertion - Periodic or Random error insertion at specified rate</li> <li>Manual Error Insertion - Manual error insertion maintaining the specified rate</li> <li>(10<sup>-1</sup> to 10<sup>-9</sup> error rate) within Ethernet packet</li> </ul>
FCS Error	<ul style="list-style-type: none"> <li>The error rate ranging between 10<sup>-1</sup> and 10<sup>-9</sup>.</li> </ul>



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## Link and Per-Port Statistics

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

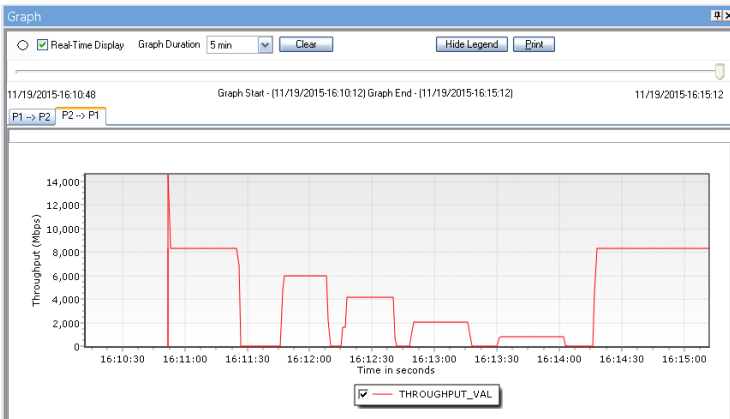
In addition to link statistics, detail per port frame statistics is also provided.

Statistic	Value P1->P2	Percent P1->P2	Value P2->P1	Percent P2->P1
TxBytes	9 869 604 244	NA	9 869 702 412	NA
10 Sec Average Throughput	1000.055	NA	1000.158	NA
1 Min Average Throughput	1000.055	NA	1000.033	NA
10 Min Average Throughput	0.000	NA	0.000	NA
RxFrames	64 461 735	NA	64 489 802	NA
TxFrames	6 518 946	NA	6 518 958	NA
Dropped Frames	57 956 118	89.908	57 983 905	89.912
No Of Packets With Errors	651 894	1.011	651 895	1.011
Dropped Packets	65 195	0.101	65 183	0.101
Duplicated Packets	64 544	0.100	64 544	0.100
Reordered Packets	0	0.000	0	0.000
Inserted Bursts for BKG Traffic	1237.83 Mbps	NA	1236.26 Mbps	NA

### Link Statistics

## Link Throughput Graph

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



### Link Throughput Graph

## Buyer's Guide

[IPN511](#) - IPLinkSim – 1G/ 10G, Two active ports (1 Link)

### Related Hardware

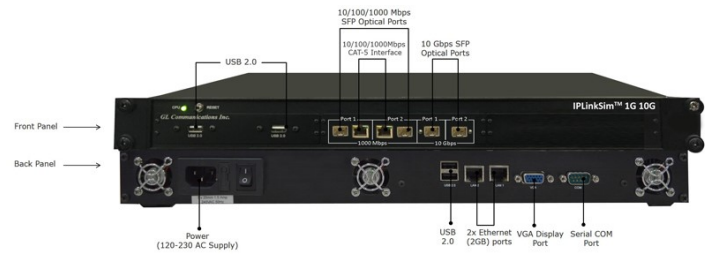
[IPN502](#) - IPNetSim™ 1G – Multi-Stream

[IPN504](#) - IPNetSim™ 10G – Multi-Stream

[IPN505](#) - IPNetSim™ 1G - Multi-Stream (Tablet Inspired)

Refer <http://www.gl.com/wan-link-emulation-iplinksim.html> webpage.

## Hardware Specifications



### IPLinkSim™ 1G/10G - 1U Rack Unit (IPN511)

#### IPLinkSim™ licenses

- IPN511 (1G/10G ports)

#### Interfaces:

- 2 x 1 Gbps Base-X Optical OR 10/100/1000 Base-T Electrical
- 2 x 10 Gbps Base-SR, -LR -ER Optical only
- Single Mode or Multi Mode Fiber SFP support with LC connector
- Optional 4-Port SMA Jack Trigger Board (TTL Input/Output)

- 19" rack, w/ Embedded Single Board Computer (SBC).
- SBC Specs: Intel Atom CPU, 4GB RAM, Windows® 7, MSATA SSD, 4 USB Ports

#### TDK-Lambda p/n LS150-12, Internal Power Supply

- Input 88 ~ 132 / 176 ~ 264VAC (switch selectable) @ 47 ~ 63Hz -or- 248~273VDC
- Output 12vDC, 150W

#### Physical Specification:

- Depth: 16.00"
- Width: 18.94" (with rack mounting flanges)  
16.73" (without rack mounting flanges)
- Height: 1.72"
- Weight: 5.75lbs



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