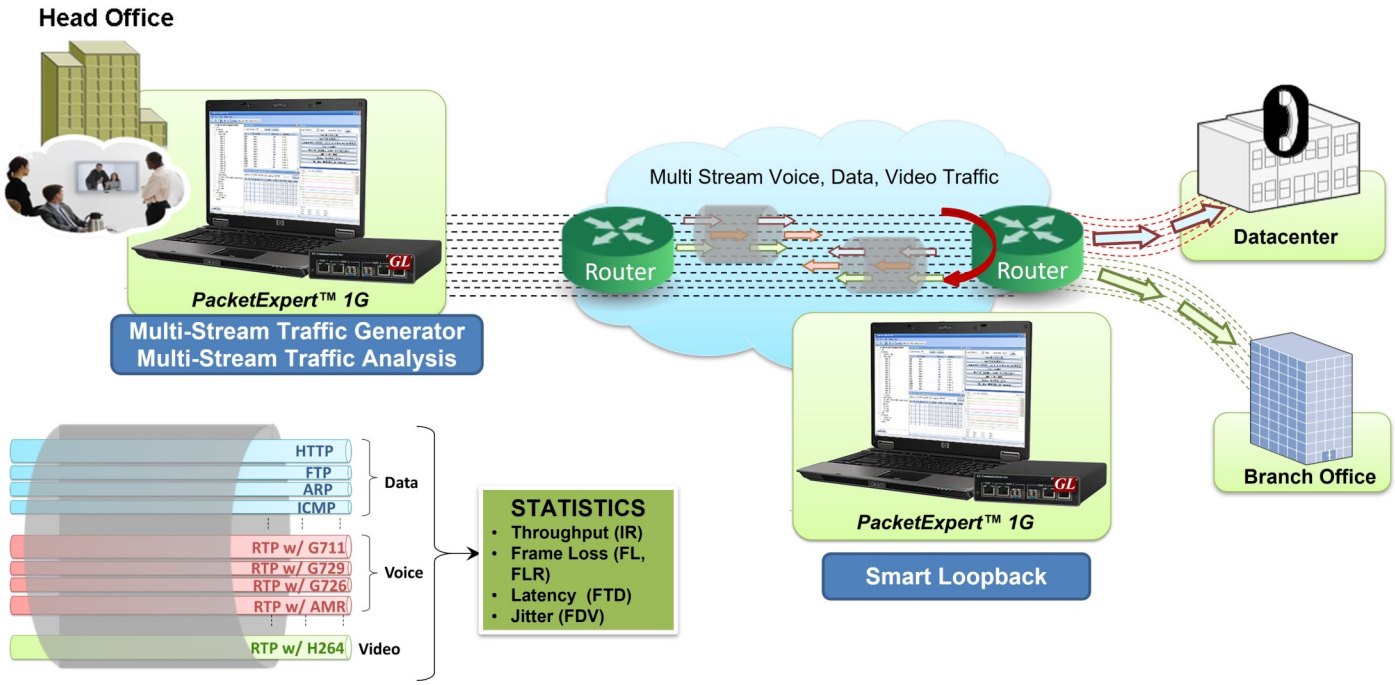
Multi Stream Traffic Generator and Analyzer (MTGA)

(PacketExpert™1G)



Overview

The Multi Stream Traffic Generator and Analyzer (PXE108) is a hardware based Ethernet tester capable of generating multi stream Ethernet traffic of varying packet length and also analyze the loopback traffic. With loopback option, this tool finds itself useful especially for end-to-end testing of 1 Gbps Wide Area Network (WAN).

The application is available as an optional software with PacketExpert™ 1G, a Quad Port Ethernet / VLAN / MPLS / IP / UDP Tester with 4 Electrical Ethernet ports. 2 of the 4 ports can be Electrical or Optical ports, enabling testing on optical fiber links as well. The electrical ports support 10 / 100 / 1000 Mbps, and optical ports support 1000 Mbps using SFP. PacketExpert™ 1G is available in portable as well as Rack mount platforms. The portable PacketExpert™ 1G platform supports all the features of high-end taps providing mobility and storage capacity to reach any point in the network.

As depicted in the network diagram above, the streams (12 streams over 1G ports) are generated as per the user defined configurations - MAC / VLAN / IP / UDP header, the rate and the frame size. Based on the Frame size, and Rate configured different classes of traffic (voice, video, data, etc) can be prioritized.

The test results include Frame Loss, Frame Delay and Frame Delay Variation metrics for each stream. Easily monitor the bandwidth performance using live Throughput (IR) consolidated graphical view for all the streams (12 streams over 1G ports). It also provides Frame Loss Ratio (FLR), Frame Transfer Delay (FTD) and Frame Delay Variation (FDV) graphical view for all the 12 streams.

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

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Main Features

- Test tool with both Ethernet traffic generation and analysis capabilities in one-box
- Generate and analyze packets at 1GigE line rates, with zero packet loss
- Periodic logging option to log the test results (in csv format) for the streams on which test is running while the test is active

Traffic Generation

- Supports multiple streams (up to 12 streams) with varying test configurations
- Streams can be defined with various header fields like Source / Destination MAC Address, VLAN Id, Source / Destination Ipv4 Address, Source / Destination UDP ports
- EMIX frame sizes supported per service – up to 5 frame sizes can be defined per stream
- Stacked VLAN supported – C-Tag and S-Tag to simulate Carrier Ethernet traffic

Traffic Analysis

- Information Rate (IR) or Throughput, Frame Loss Ratio (FLR), Frame Transfer Delay (FTD) or Latency, and Frame Delay Variation (FDV) or Jitter, metrics and graphs for the configured multi streams
- Easily monitor the bandwidth performance using live throughput consolidated graphical view for all the streams (12 streams over 1G ports).
- Detailed per stream statistics for unique streams
- Provides per port frame statistics like Total Frames/Bytes Received, Rx Frame Rate, Rx Data Rate, etc.

Traffic Generation

Stream Configuration

The Stream configuration summary can be viewed at a glance by collapsing the configuration panes. Each Stream can be configured for various attributes like the Frame Size(s), MAC, VLAN, IP, UDP Header Parameters (including VLAN Tag Information), Payload and Traffic rate parameters.

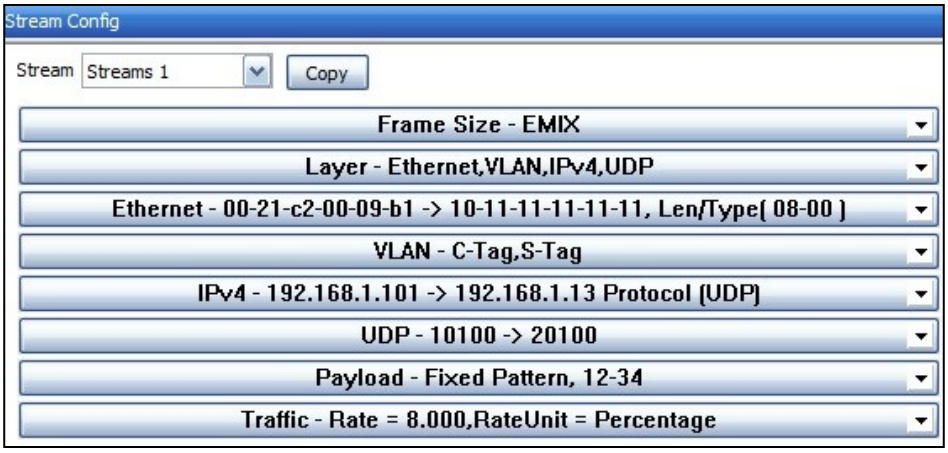


Figure: Stream Configuration Collapsed Summary View

Ethernet VLAN C-TAG Configuration

User can enable VLAN configuration and set the Customer Tag (C-Tag) and Service Tag (S-Tag) Vlan Type, ID, and Priority. The 2 byte VLAN segment Tag Control Information (TCI) includes 3 bit Carry Priority Information (PCP) field which indicates traffic priorities, which the user can configure.

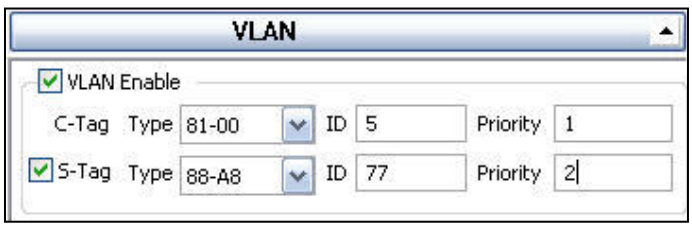


Figure: VLAN C-Tag Configuration

Traffic Generation (*Contd.*)

Payload and Traffic Configuration

User can enable VLAN configuration and set the C-Tag and S-Tag Vlan Type, ID, and Priority. The 2 byte VLAN segment TCI includes 3 bit PCP field which indicates traffic priorities, which the user can configure.

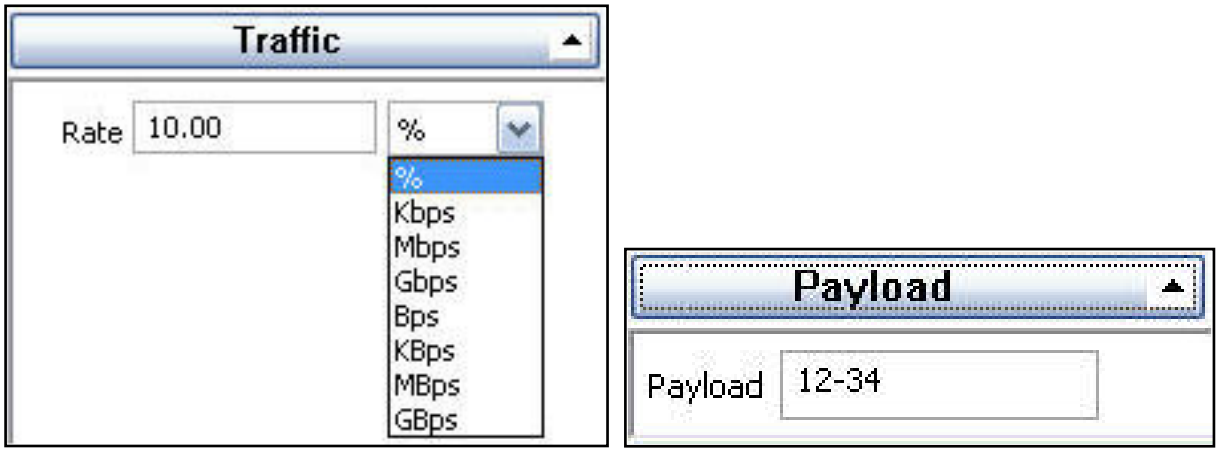


Figure: Payload Configuration

Frame Size Configuration

Users can configure frame sizes in bytes for each stream, which includes Fixed and EMix Frame Size types. Fixed frame size can be set to any value between min (>64) and max frame size (1518 for normal frame sizes and up to 2048 bytes for Jumbo frames) range. A single Test Flow can also consist of up to 5 different frame sizes called an Ethernet Mix (EMIX), simulating real-time traffic.

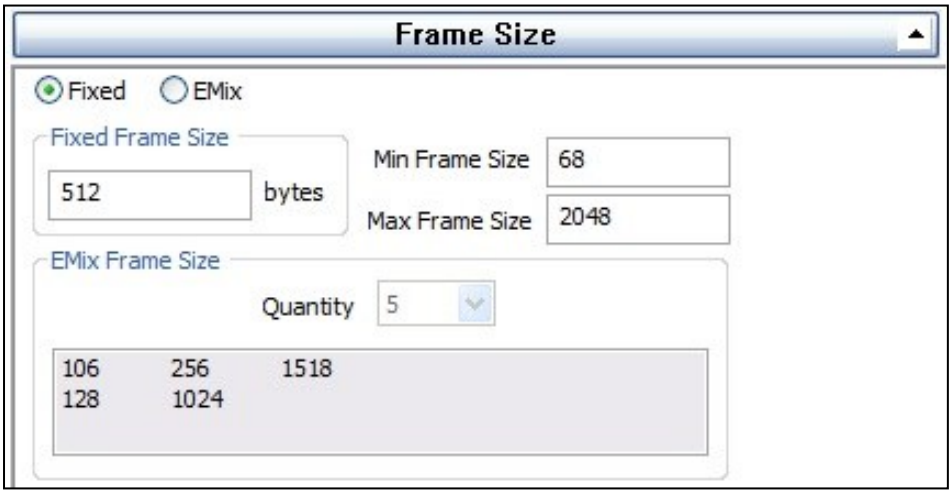


Figure: Frame Size Configuration

Traffic Generation (*Contd.*)

Stream Selection

Stream selection provides an option to select any configured stream to run the test (or) select all the streams (12 streams are supported) to perform the test. The configured Frame Size and the Rate (Mbps) for the stream is also displayed for each stream. The test is performed on all the selected streams simultaneously within the specified time duration.

Stream Selection

Available Bandwidth 112.00 Select All Deselect All

Selection	#	Stream Name	Frame Size	Rate (Mbps)
Deselect	1	Stream1	512	80.00
Deselect	2	Stream2	512	80.00
Deselect	3	Stream3	1380	80.00
Deselect	4	Stream4	1380	80.00
Deselect	5	Stream5	1034	80.00
Deselect	6	Stream6	130	80.00
Deselect	7	Stream7	1380	80.00
Deselect	8	Stream8	1024	8.00
Deselect	9	Stream9	512	80.00
Deselect	10	Stream10	200	80.00
Deselect	11	Stream11	130	80.00
Deselect	12	Stream12	130	80.00

Figure: Stream Selection

Traffic Analysis

Stream-wise Throughput (IR) and FTD Graph

A real time display of Throughput (IR) and FTD for each stream is plotted against Time (Sec), in the form of a line graph. Consolidated view of throughput graph for all the streams (12 streams on 1G ports) is displayed. The total throughput of all the 12 streams together will sum up to 1000 Mbps on 1G ports.

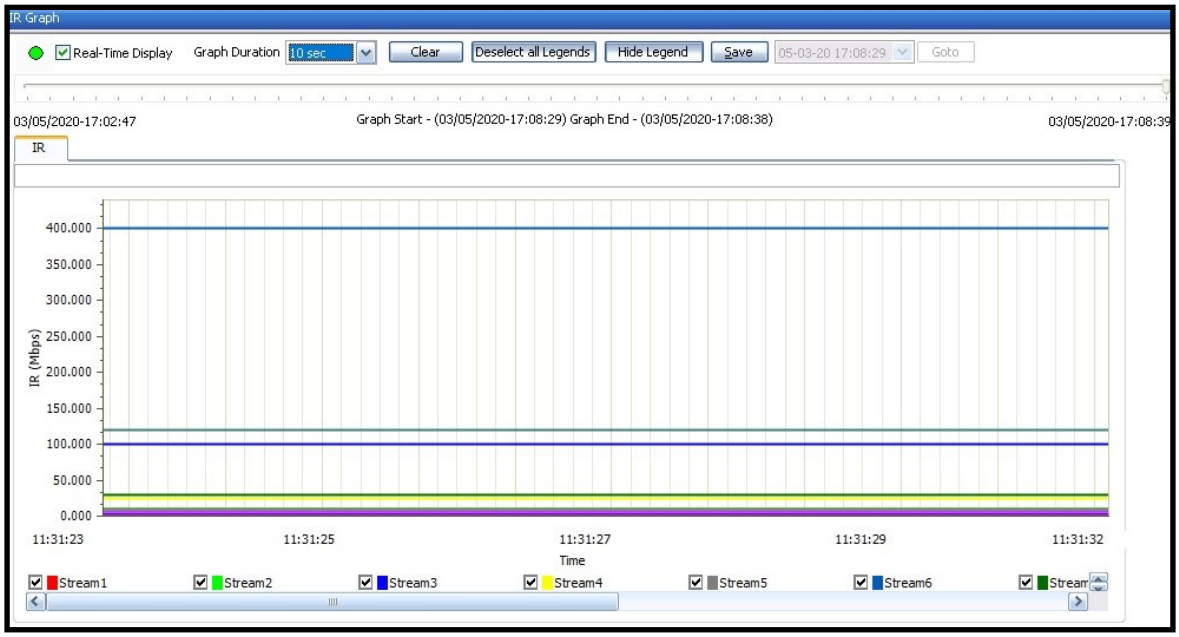


Figure: Throughput (IR) Graph

Traffic Analysis (*Contd.*)

Stream-wise Throughput (IR) and FTD Graph

Figure: Frame Transfer Delay (FTD) Graph

Stream-wise FLR and FDV Graph

A real time display of FLR and FDV for each stream is plotted against Time (Sec), in the form of a line graph. Consolidated view of throughput graph for all the streams (12 streams on 1G ports) is displayed. The total throughput of all the 12 streams together will sum up to 1000 Mbps on 1G ports.

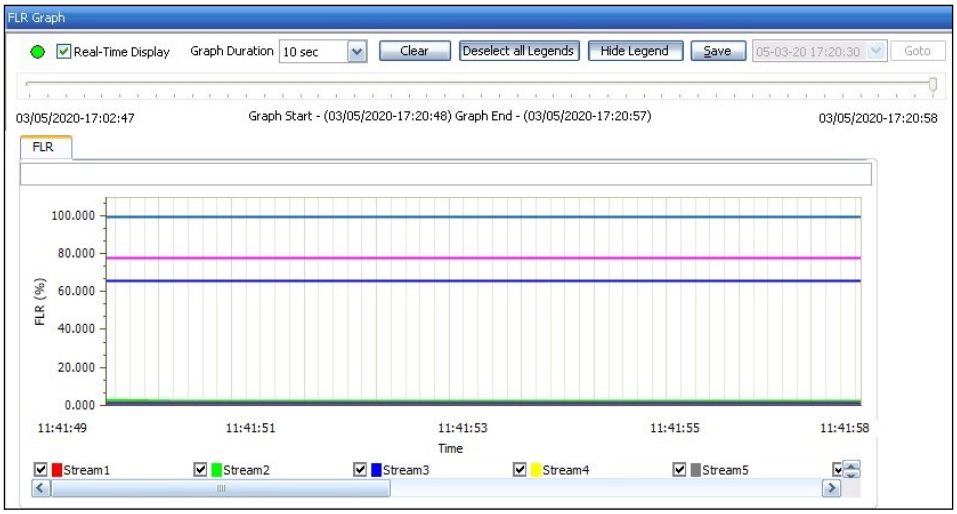


Figure: Frame Loss Ratio (FLR) Graph

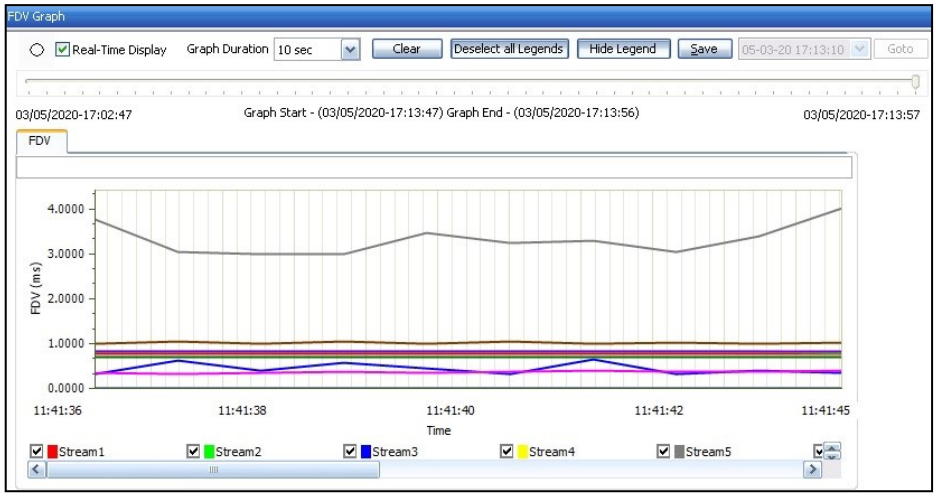


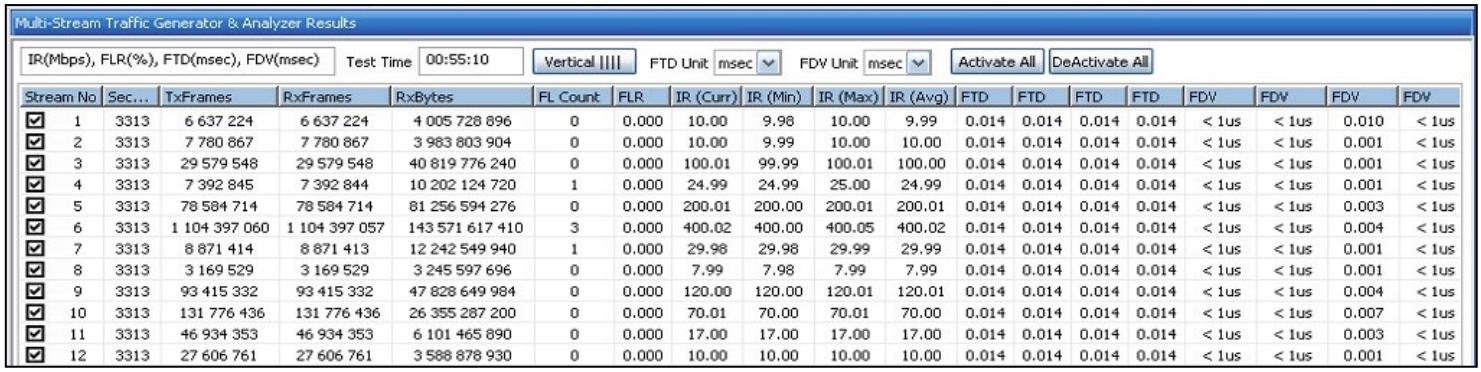
Figure: Frame Delay Variation (FDV) Graph

Traffic Analysis (*Contd.*)

Results

The consolidated view of all the streams (up to 12 streams) results are displayed for each configured stream, which includes Stream ID for which the test is running, Test duration in secs, TxRx Frames, Rx Bytes, and Current, Minimum, Maximum, and Average values of -

- Frame Loss - Frame Loss Count, Frame Loss Ratio - FLR (%)
- Information Rate - IR (Mbps)
- Frame Transfer Delay - FTD (msec)
- Frame Delay Variations - FDV (msec)

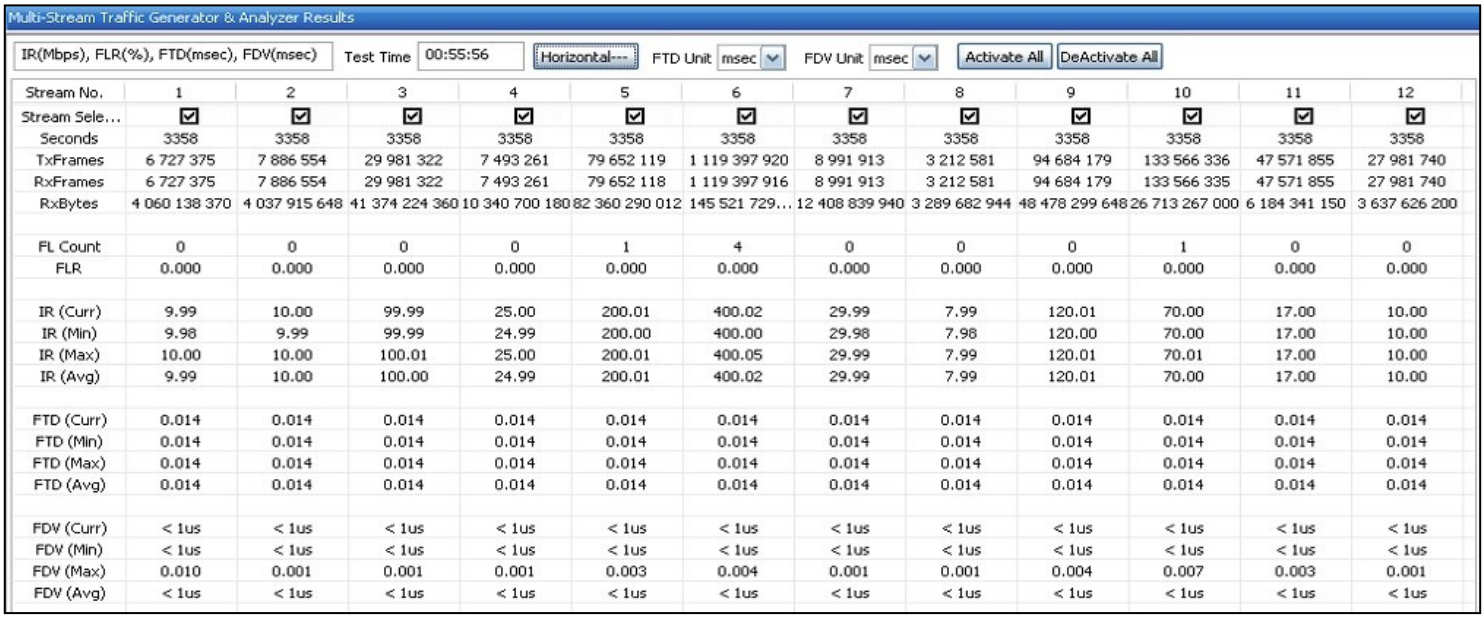


Multi-Stream Traffic Generator & Analyzer Results

IR(Mbps), FLR(%), FTD(msec), FDV(msec) | Test Time 00:55:10 | Vertical |||| | FTD Unit msec | FDV Unit msec | Activate All | DeActivate All

Stream No	Sec...	TxFrames	RxFrames	RxBytes	FL Count	FLR	IR (Curr)	IR (Min)	IR (Max)	IR (Avg)	FTD	FTD	FTD	FTD	FDV	FDV	FDV	FDV
1	3313	6 637 224	6 637 224	4 005 728 896	0	0.000	10.00	9.98	10.00	9.99	0.014	0.014	0.014	0.014	< 1us	< 1us	0.010	< 1us
2	3313	7 780 867	7 780 867	3 983 803 904	0	0.000	10.00	9.99	10.00	10.00	0.014	0.014	0.014	0.014	< 1us	< 1us	0.001	< 1us
3	3313	29 579 548	29 579 548	40 819 776 240	0	0.000	100.01	99.99	100.01	100.00	0.014	0.014	0.014	0.014	< 1us	< 1us	0.001	< 1us
4	3313	7 392 845	7 392 844	10 202 124 720	1	0.000	24.99	24.99	25.00	24.99	0.014	0.014	0.014	0.014	< 1us	< 1us	0.001	< 1us
5	3313	78 584 714	78 584 714	81 256 594 276	0	0.000	200.01	200.00	200.01	200.01	0.014	0.014	0.014	0.014	< 1us	< 1us	0.003	< 1us
6	3313	1 104 397 060	1 104 397 057	143 571 617 410	3	0.000	400.02	400.00	400.05	400.02	0.014	0.014	0.014	0.014	< 1us	< 1us	0.004	< 1us
7	3313	8 871 414	8 871 413	12 242 549 940	1	0.000	29.98	29.98	29.99	29.99	0.014	0.014	0.014	0.014	< 1us	< 1us	0.001	< 1us
8	3313	3 169 529	3 169 529	3 245 597 696	0	0.000	7.99	7.98	7.99	7.99	0.014	0.014	0.014	0.014	< 1us	< 1us	0.001	< 1us
9	3313	93 415 332	93 415 332	47 828 649 984	0	0.000	120.00	120.00	120.01	120.01	0.014	0.014	0.014	0.014	< 1us	< 1us	0.004	< 1us
10	3313	131 776 436	131 776 436	26 355 287 200	0	0.000	70.01	70.00	70.01	70.00	0.014	0.014	0.014	0.014	< 1us	< 1us	0.007	< 1us
11	3313	46 934 353	46 934 353	6 101 465 890	0	0.000	17.00	17.00	17.00	17.00	0.014	0.014	0.014	0.014	< 1us	< 1us	0.003	< 1us
12	3313	27 606 761	27 606 761	3 588 878 930	0	0.000	10.00	10.00	10.00	10.00	0.014	0.014	0.014	0.014	< 1us	< 1us	0.001	< 1us

Figure: Vertical Stream Result View



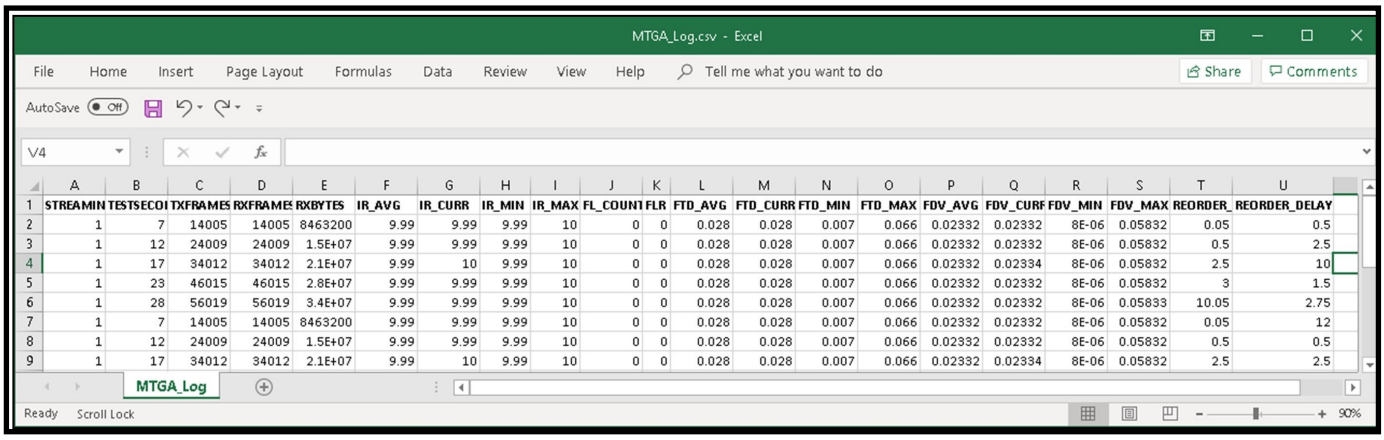
Multi-Stream Traffic Generator & Analyzer Results

IR(Mbps), FLR(%), FTD(msec), FDV(msec) | Test Time 00:55:56 | Horizontal--- | FTD Unit msec | FDV Unit msec | Activate All | DeActivate All

Stream No.	1	2	3	4	5	6	7	8	9	10	11	12
Stream Sele...	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Seconds	3358	3358	3358	3358	3358	3358	3358	3358	3358	3358	3358	3358
TxFrames	6 727 375	7 886 554	29 981 322	7 493 261	79 652 119	1 119 397 920	8 991 913	3 212 581	94 684 179	133 566 336	47 571 855	27 981 740
RxFrames	6 727 375	7 886 554	29 981 322	7 493 261	79 652 118	1 119 397 916	8 991 913	3 212 581	94 684 179	133 566 335	47 571 855	27 981 740
RxBytes	4 060 138 370	4 037 915 648	41 374 224 360	10 340 700 180	82 360 290 012	145 521 729...	12 408 839 940	3 289 682 944	48 478 299 648	26 713 267 000	6 184 341 150	3 637 626 200
FL Count	0	0	0	0	1	4	0	0	0	1	0	0
FLR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IR (Curr)	9.99	10.00	99.99	25.00	200.01	400.02	29.99	7.99	120.01	70.00	17.00	10.00
IR (Min)	9.98	9.99	99.99	24.99	200.00	400.00	29.98	7.98	120.00	70.00	17.00	10.00
IR (Max)	10.00	10.00	100.01	25.00	200.01	400.05	29.99	7.99	120.01	70.01	17.00	10.00
IR (Avg)	9.99	10.00	100.00	24.99	200.01	400.02	29.99	7.99	120.01	70.00	17.00	10.00
FTD (Curr)	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
FTD (Min)	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
FTD (Max)	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
FTD (Avg)	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
FDV (Curr)	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us
FDV (Min)	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us
FDV (Max)	0.010	0.001	0.001	0.001	0.003	0.004	0.001	0.001	0.004	0.007	0.003	0.001
FDV (Avg)	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us

Figure: Horizontal Stream Result View

Periodic Logging (*Contd.*)

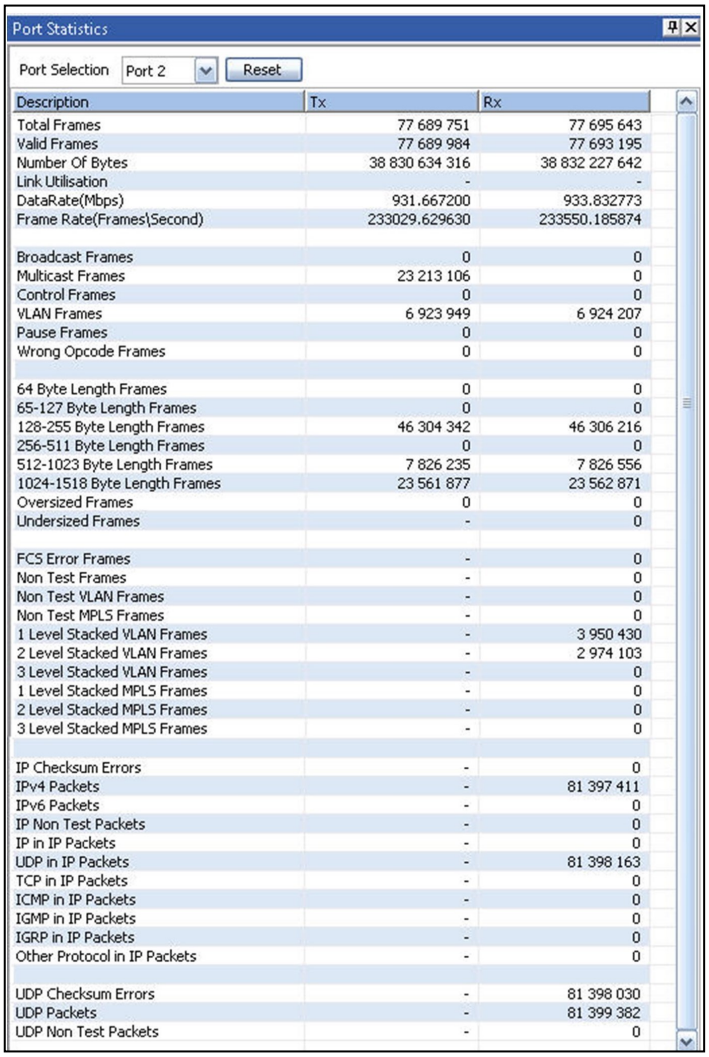


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	STREAMIN	TESTSECOI	TXFRAMES	RXFRAMES	RXBYTES	IR_AVG	IR_CURR	IR_MIN	IR_MAX	FL_COUNT	FLR	FTD_AVG	FTD_CURR	FTD_MIN	FTD_MAX	FDV_AVG	FDV_CURR	FDV_MIN	FDV_MAX	REORDER_	REORDER_DELAY
2	1	7	14005	14005	8463200	9.99	9.99	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02332	8E-06	0.05832	0.05	0.5
3	1	12	24009	24009	1.5E+07	9.99	9.99	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02332	8E-06	0.05832	0.5	2.5
4	1	17	34012	34012	2.1E+07	9.99	10	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02334	8E-06	0.05832	2.5	10
5	1	23	46015	46015	2.8E+07	9.99	9.99	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02332	8E-06	0.05832	3	1.5
6	1	28	56019	56019	3.4E+07	9.99	9.99	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02332	8E-06	0.05833	10.05	2.75
7	1	7	14005	14005	8463200	9.99	9.99	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02332	8E-06	0.05832	0.05	12
8	1	12	24009	24009	1.5E+07	9.99	9.99	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02332	8E-06	0.05832	0.5	0.5
9	1	17	34012	34012	2.1E+07	9.99	10	9.99	10	0	0	0.028	0.028	0.007	0.066	0.02332	0.02334	8E-06	0.05832	2.5	2.5

Figure: Periodic Log *.csv File for 16 Streams

Port Statistics

The detailed Tx Rx frame statistics per port are provided. In addition to statistics like Frame Count, Frame Rate, Link Utilization, other statistics like Frame Type (Unicast / Broadcast / Multicast, VLAN), frame lengths (64, 65-127, 1024-1518, Oversized, Undersized), and FCS Error Frames are also provided.



Description	Tx	Rx
Total Frames	77 689 751	77 695 643
Valid Frames	77 689 984	77 693 195
Number Of Bytes	38 830 634 316	38 832 227 642
Link Utilisation	-	-
DataRate(Mbps)	931.667200	933.832773
Frame Rate(Frames\Second)	233029.629630	233550.185874
Broadcast Frames	0	0
Multicast Frames	23 213 106	0
Control Frames	0	0
VLAN Frames	6 923 949	6 924 207
Pause Frames	0	0
Wrong Opcode Frames	0	0
64 Byte Length Frames	0	0
65-127 Byte Length Frames	0	0
128-255 Byte Length Frames	46 304 342	46 306 216
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	7 826 235	7 826 556
1024-1518 Byte Length Frames	23 561 877	23 562 871
Oversized Frames	0	0
Undersized Frames	-	0
FCS Error Frames	-	0
Non Test Frames	-	0
Non Test VLAN Frames	-	0
Non Test MPLS Frames	-	0
1 Level Stacked VLAN Frames	-	3 950 430
2 Level Stacked VLAN Frames	-	2 974 103
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	-	81 397 411
IPv6 Packets	-	0
IP Non Test Packets	-	0
IP in IP Packets	-	0
UDP in IP Packets	-	81 398 163
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	-	81 398 030
UDP Packets	-	81 399 382
UDP Non Test Packets	-	0

Figure: Port Statistics

Report Generation

The Report Generation option allows to create detailed test report in PDF and CSV formats. This window lets the user configure the report file details.

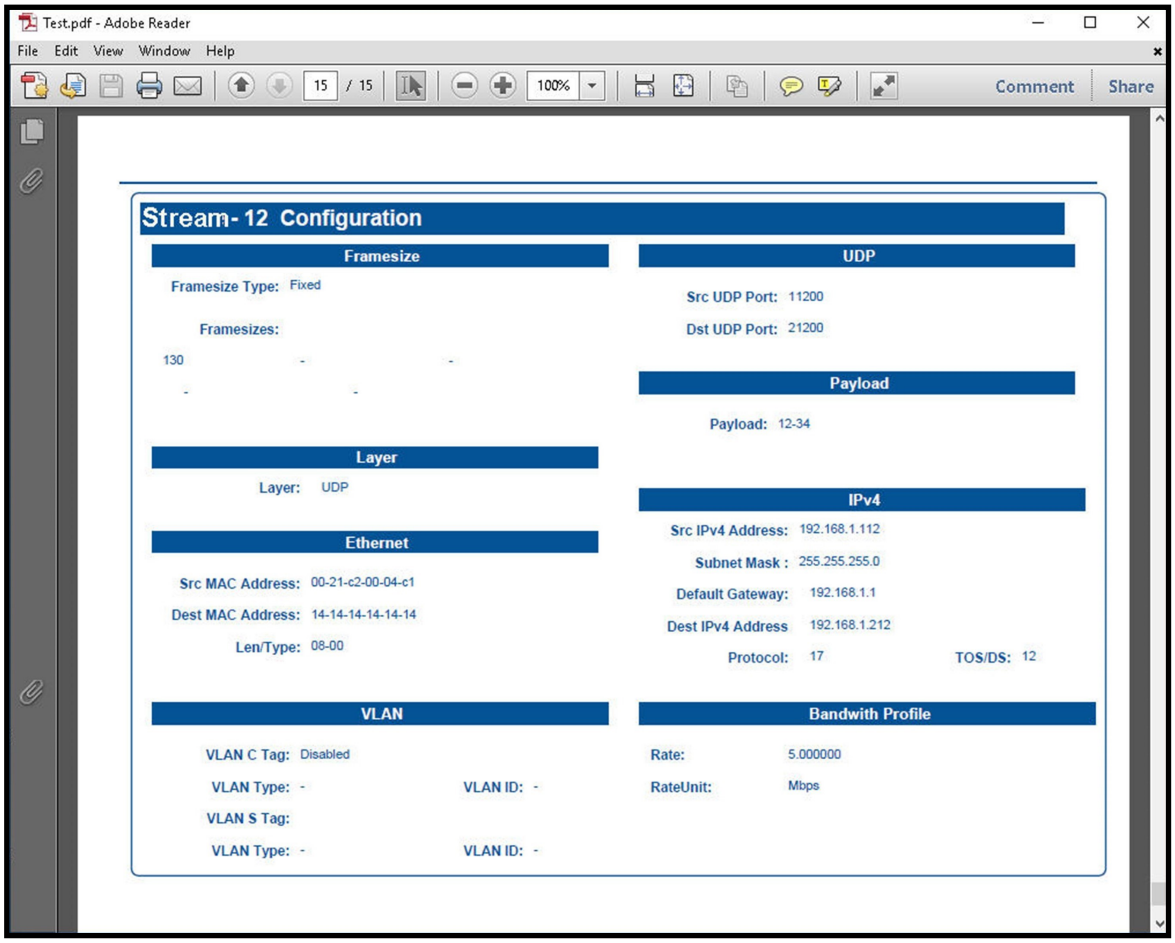


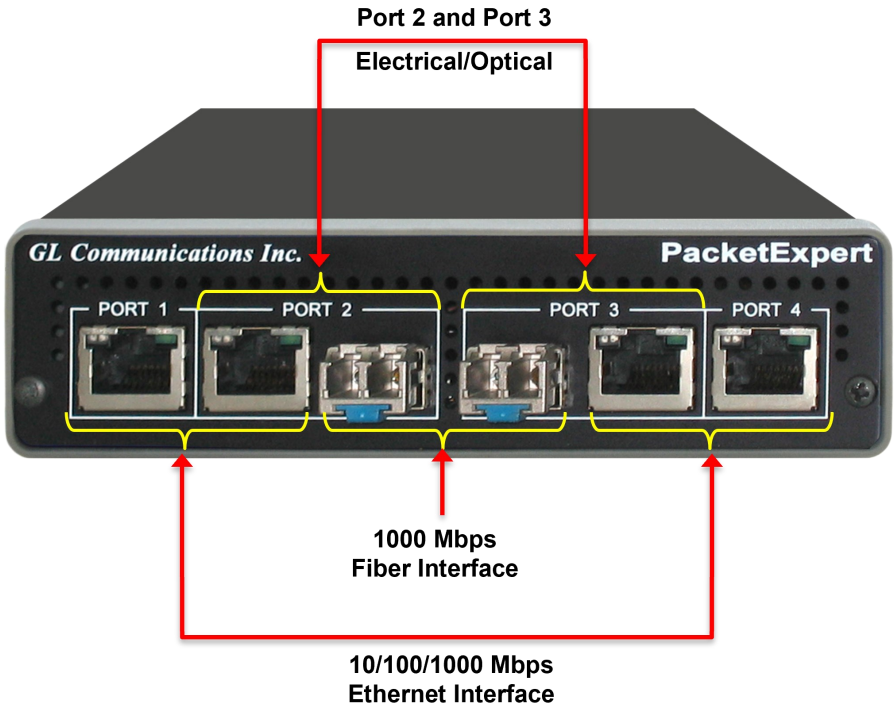
Figure: PDF Report Sample

Command Line Interface (CLI)

PacketExpert™ is enhanced to support Command Line Interface (CLI) with additional CXE100 license to access all the functionalities remotely using Python client ,C# client and MAPS™ CLI Server.

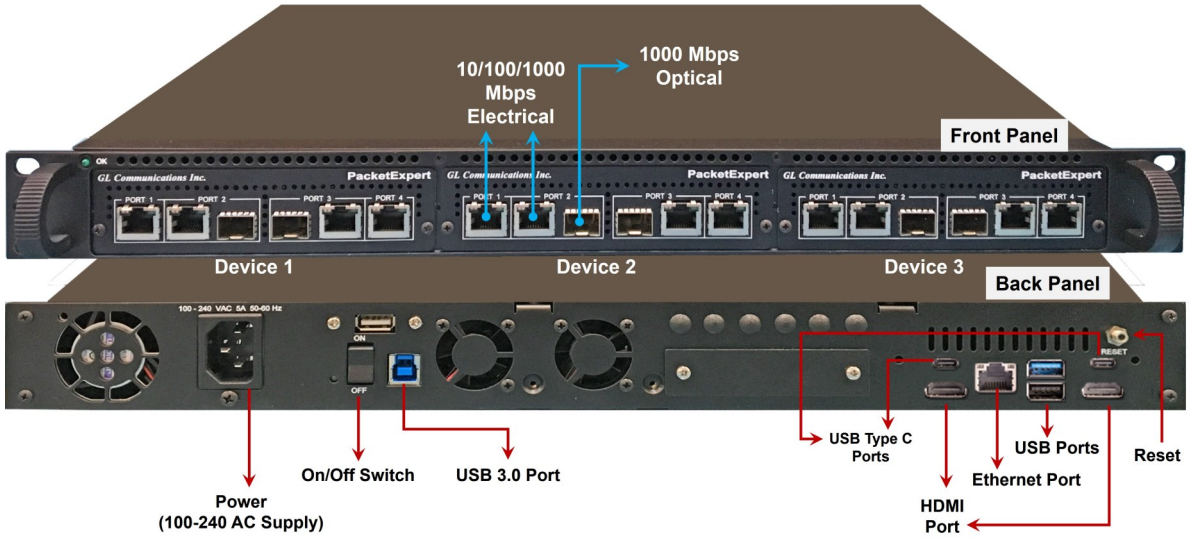
The CLI supports all the PacketExpert™ test modules including - All Port Bert, Bert Loopback, All Port Loopback, RFC 2544, Record/ Playback, PacketBroker, ExpertSAM™.

Portable PacketExpert™ 1G Specifications



Interfaces	• 2 x 10 / 100 / 1000 Base-T Electrical only • 2 x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical • Single Mode or Multi Mode Fiber SFP support with LC connector
Protocols	• RFC 2544 compliance
Bus Interface	• USB 2.0 or USB 3.0
Power	• +12 volts (Medical Grade), 3 Amps
Temperature	• Operating Temperature: +5 to +40C • Non-Operating Temperature: -30 to +60C
Humidity	• Operating Humidity: 0% to 80% RH • Non-Operating Humidity: 0% to 95% RH
Altitude	• Operating Altitude: Up to 10,000 feet • Non-Operating Altitude: Up to 50,000 feet
Physical Specification	• 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)

mTOP™ PacketExpert™ 1G Rack Specifications



Interfaces	12 Total Ethernet Ports (HD-PacketExpert-12) • mTOP™ System (embedded SBC, 3x PXE100) • PacketExpert™ 1G (PXE100) interfaces - – 6x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical – 6x (10/100/1000) Base-T Electrical 24 Total Ethernet Ports (HD-PacketExpert-24) • mTOP™ System (embedded SBC, 6x PXE100) • PacketExpert™ 1G (PXE100) interfaces - – 12x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical
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, ATX Power Supply • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports
External Dimension	• Length: 16 Inches • Width: 19 Inches • Height: 2x 1U mTOP™ (HD-PacketExpert-24) or 1U mTOP™ (HD-PacketExpert-12)
Power Supply	• ATX Power Supply
Order Information	• PXE100 - PacketExpert™ Options • MT001/MT001E (1U) • MT001+MT002/ MT001E+MT002 (Stacked 1U)

mTOP™ 1G Probe Specifications

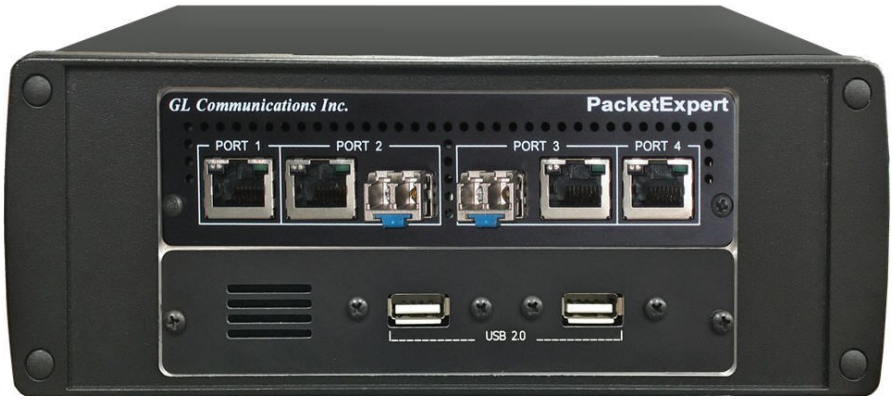


Figure: mTOP™ Probe with 1G Hardware Unit + SBC

Interfaces	• 4x Total Ethernet ports • 2x 10/100/1000 Base-T Electrical only • 2x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical • Single Mode or Multi Mode Fiber SFP support with LC connector
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, 12V/3A Power Supply • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports
External Dimension	• Length: 10.4 inches • Height: 3 inches • Width: 8.4 inches
Power Supply	• 12 Volts (Medical Grade), 3 Amps
Order Information	• PXE100 • MT005/MT005E

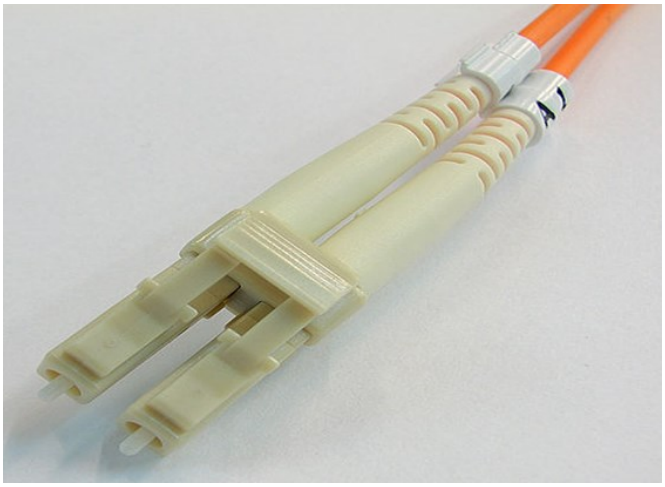
Pelican Carry On Case

Supported SFP Modules

PacketExpert™ supports LC connectors and 850/1310 nm SFP (Small Form-Factor Pluggable) modules. For users with different connector types, appropriate adapters such as LC-to-SC, LC-to-FC, or their reverse equivalents are required.

The following SFP modules are supported in 1G:

- **1000BaseLX** - Long range, MM and SM
- **1000BaseSX** - Short range, MM and SM
- **1000BaseT** - Copper and many more



LC Connectors

850/1310 nm SFP Module

Buyer's Guide

Item No	Product Description
PXE108	Multi Stream UDP/TCP Traffic Generator and Analyzer
CXE100	CLI support for PXE100

Item No	Related Software
PXE105	Wire speed Record/Playback 1G
PXE107	PacketBroker 1G
PXE108	ExpertTCP™ 1G
ETH100	PacketCheck™

Item No	Related Hardware
PXE100	PacketExpert™ 1G
PXE104	PacketExpert™ - SA (4 ports)
PXE112	PacketExpert™ - SA (12 Ports)
PXE124	PacketExpert™ - SA (24 Ports)

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

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

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