Comprehensive Ethernet Testing Solutions

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GL Communications Inc. - Overview

- Headquartered in Gaithersburg, Maryland USA
- Founded in 1986
- Engineering Consulting Services
- Test & Measurement Equipment
  - Analog, TDM, Ethernet/IP, SONET/SDH, Wireless (2G, 3G, 4G, 5G)
  - Analysis, monitoring, visualization, capture, long term storage

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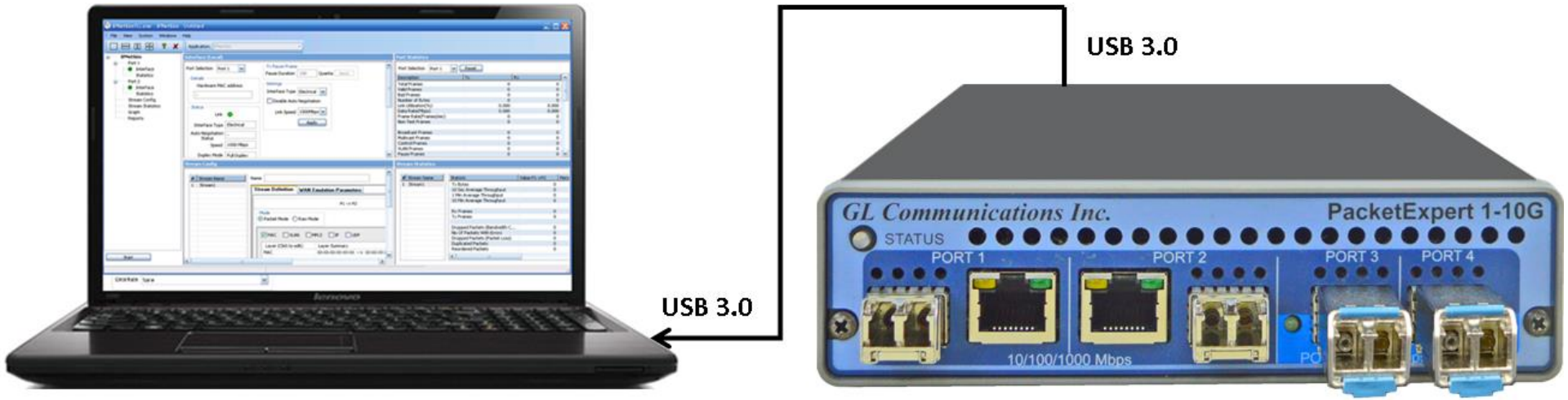
PacketExpert™ Software



Windows 7/8/10 64-bit OS

- BERT
- RFC 2544
- Smart Loopback
- IPNetSim™
- IPLinkSim™
- ITU-T Y.1564 (ExpertSAM™)
- Wire-Speed Record / Playback
- PacketBroker™
- Multi-Stream Traffic Generator Analyzer
- RFC-6349 based TCP Throughput Testing (ExpertTCP™)

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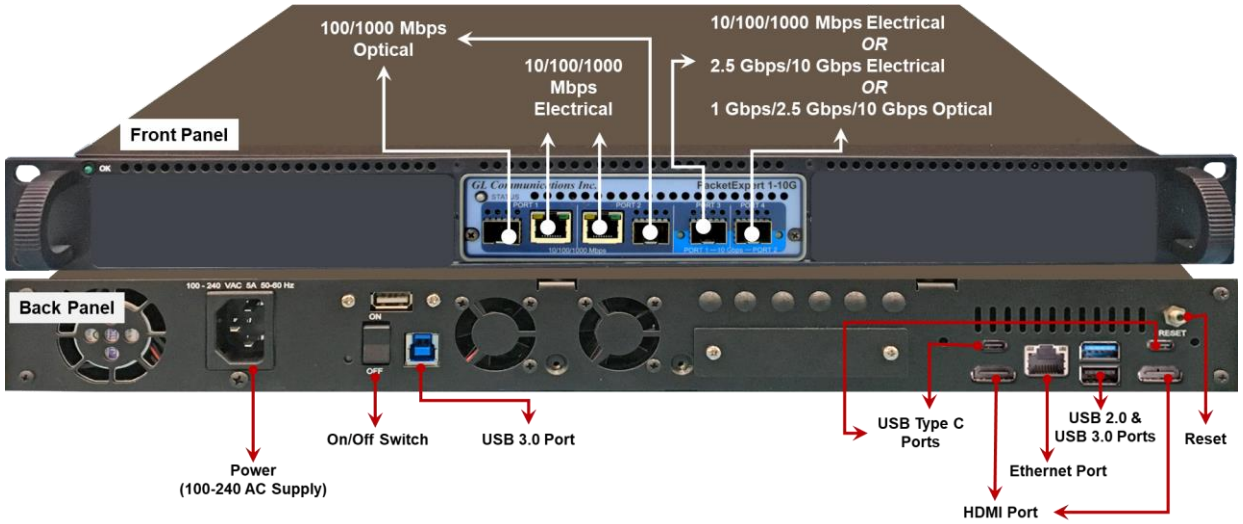
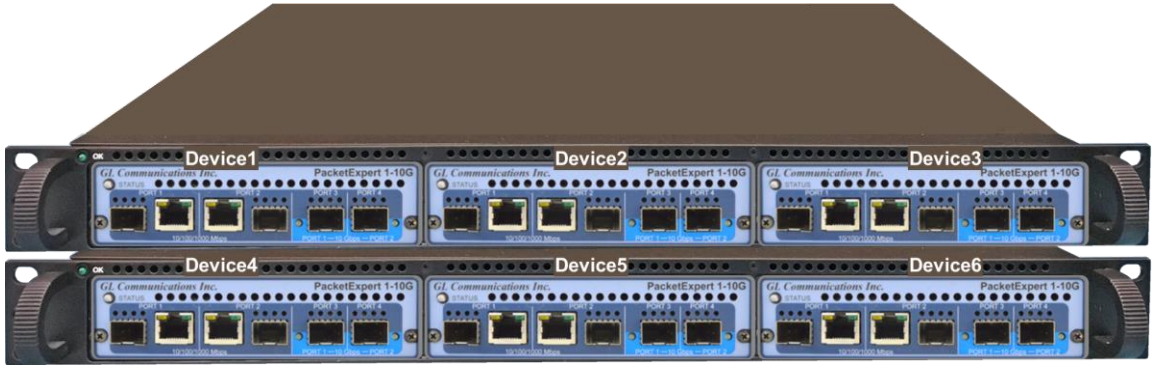
mTOP™ Rack and mTOP™ Probe Units with 10GX Hardware

High Density 1U Rack option

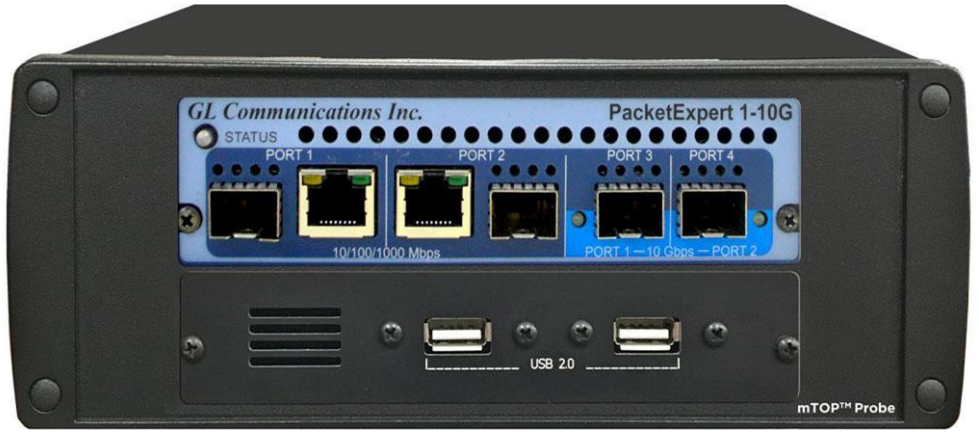


Stacked High Density 1U Rack option



mTOP™ 1U Rack Option with 12 TTL

mTOP™ Probe Unit



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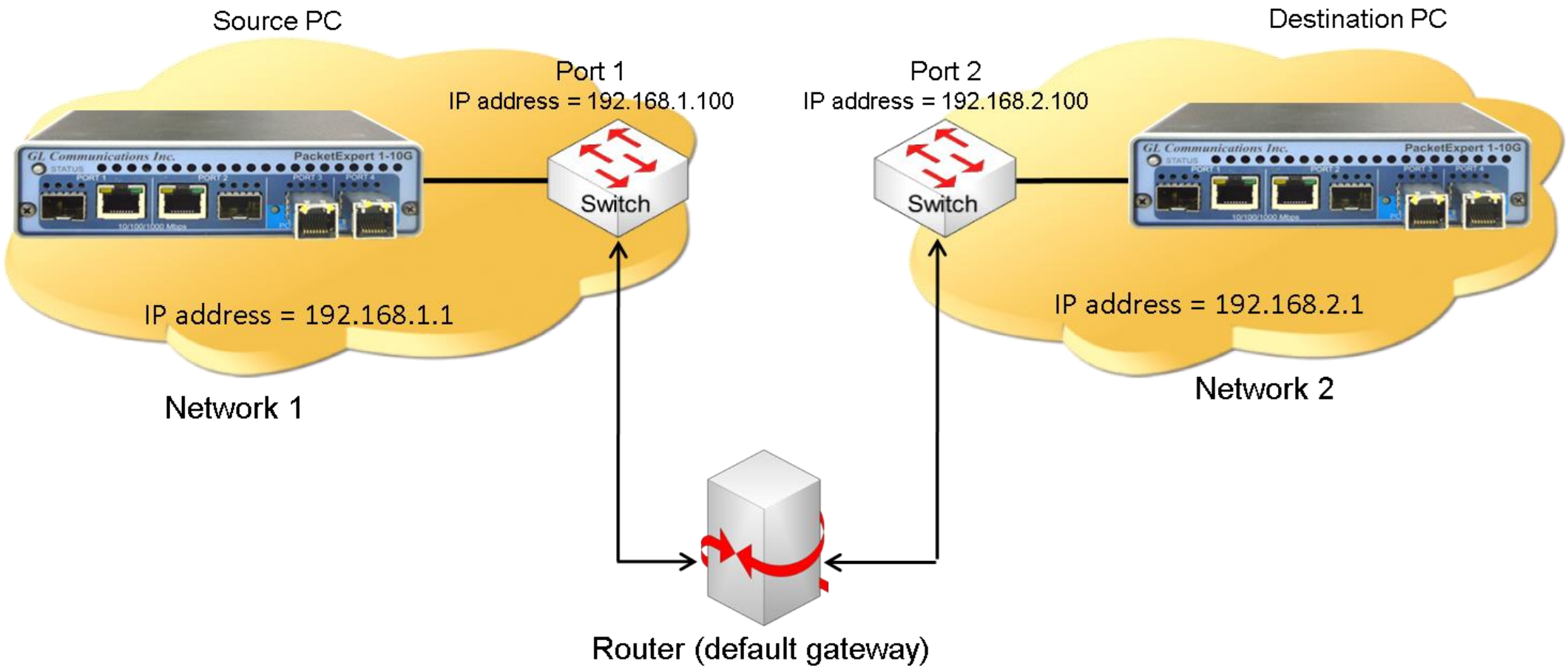
Ethernet IP Testing

- Wirespeed BERT
- Smart Loopback
- RFC 2544
- ITU-T Y.1564 (ExpertSAM™)
- Multi-Stream Traffic Generator Analyzer UDP/TCP
- Wire-Speed Record / Playback
- PacketBroker™
- Network Emulation – IPNetSim™, IPLinkSim™

BER Test Setup at Layer 3 / 4

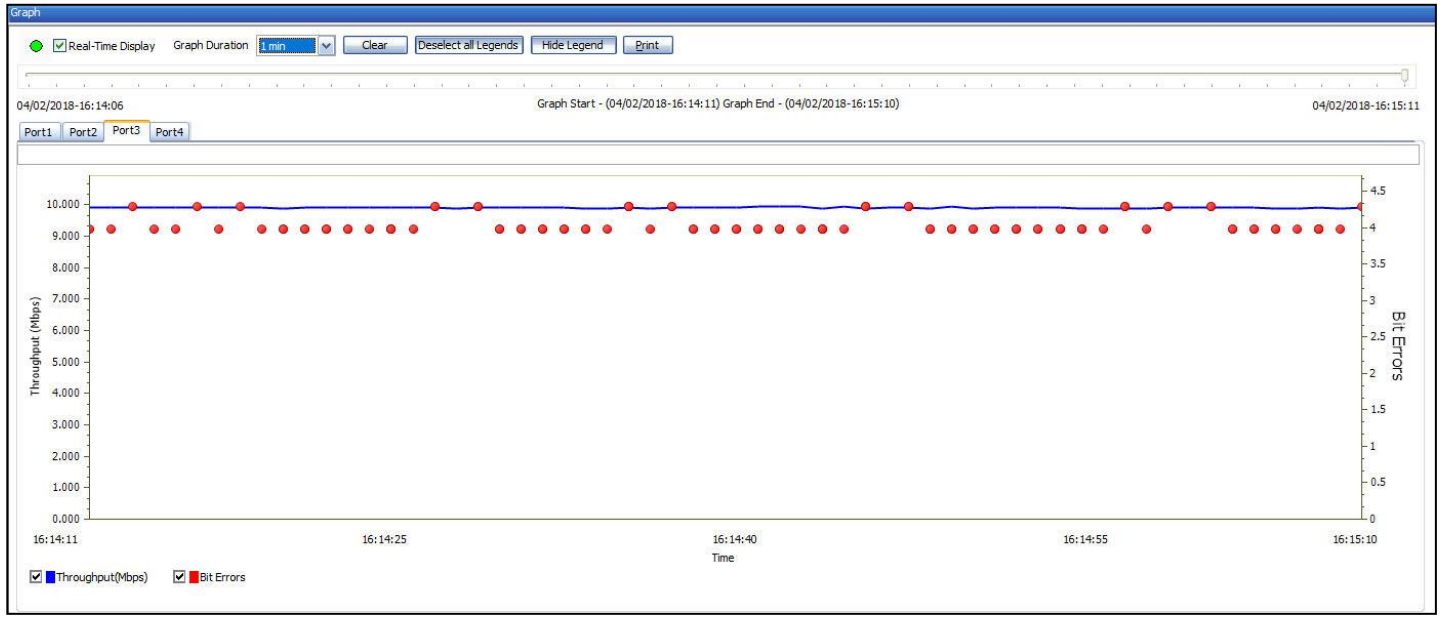
Layer 3 Testing between PacketExpert™ located in different IP Networks

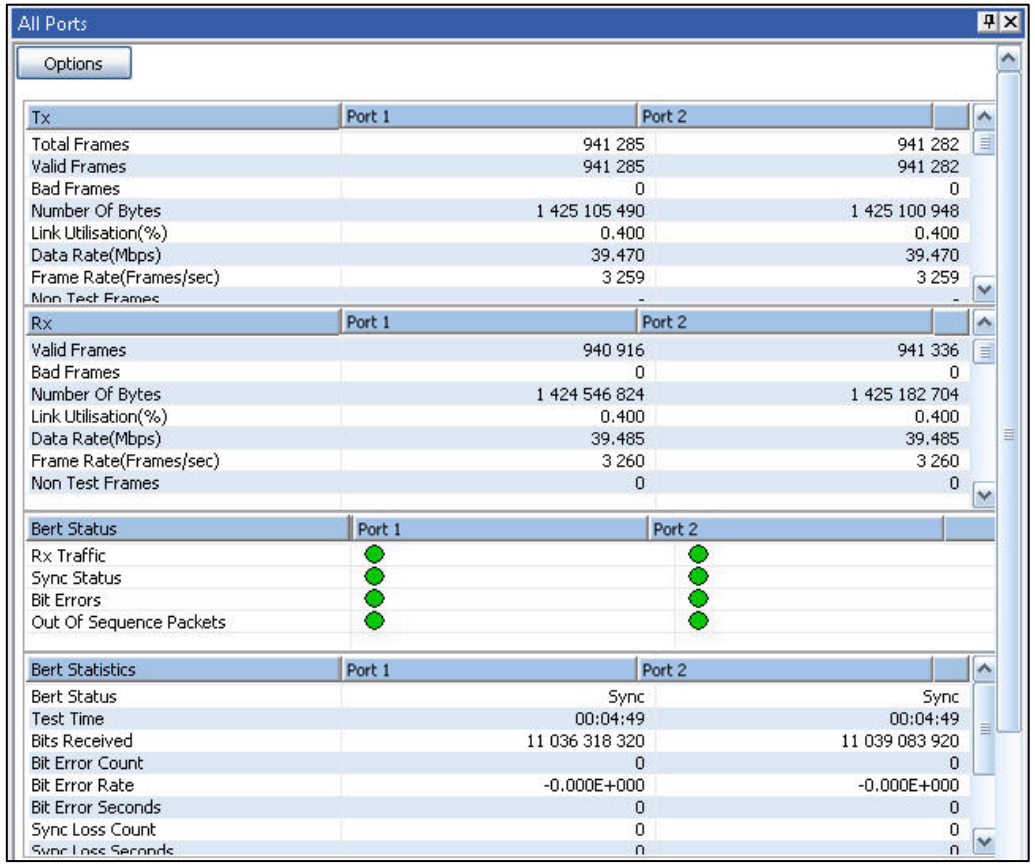


In this case, Source and the Destination PacketExpert™ applications are located in different IP networks. These 2 networks are connected through a router. A simple example above shows 2 LANs connected through a router

BERT Results (with LEDs) and Graph

- Optional Sequence number insertion allows detecting Out-of-sequence packets and packet loss
- Detailed BERT statistics like the Bit Error Count, Bit Error Rate, Bit Error Seconds etc., are provided
- Bit Error Count is displayed in both Tabular and Graphical formats





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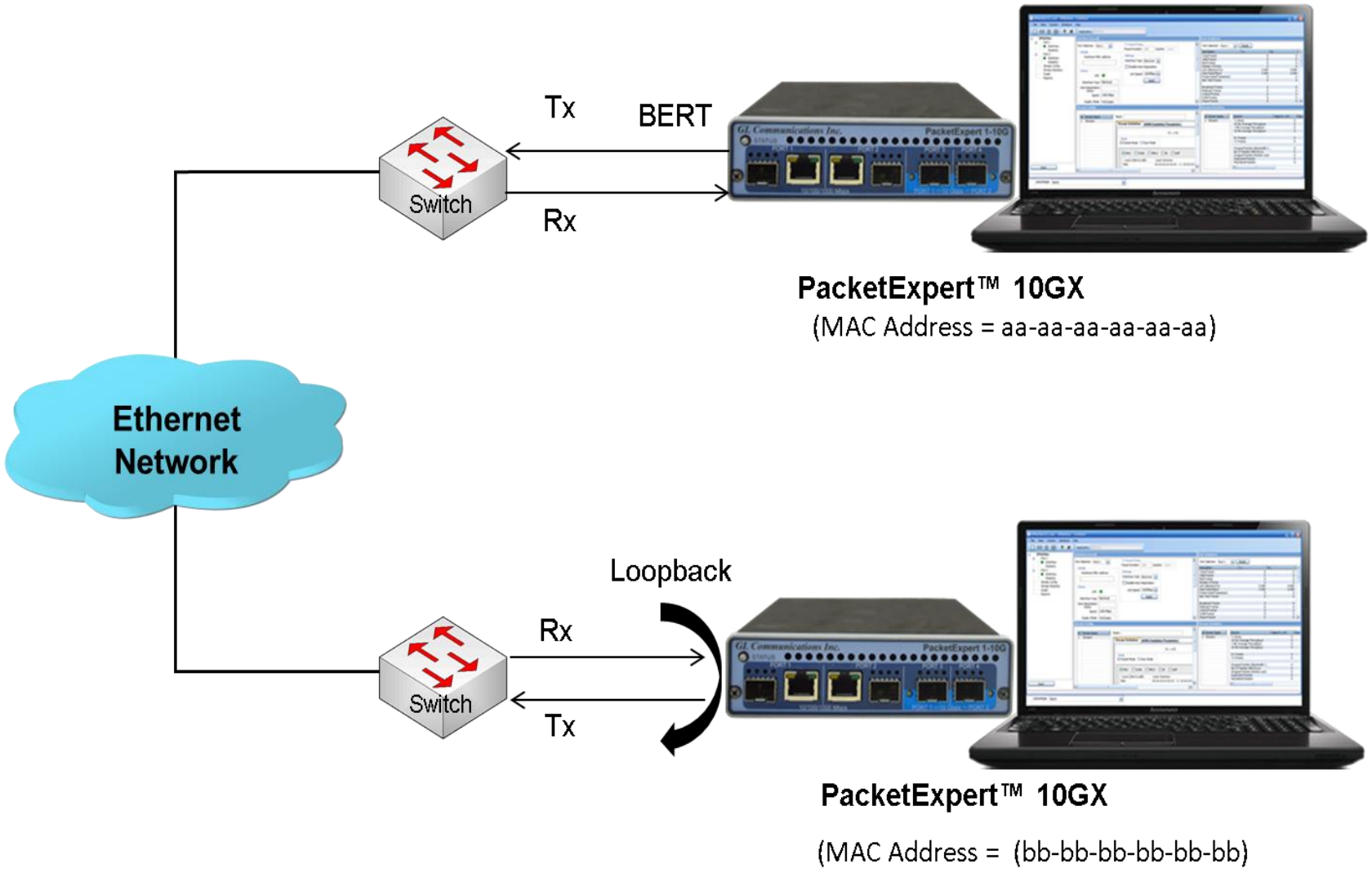
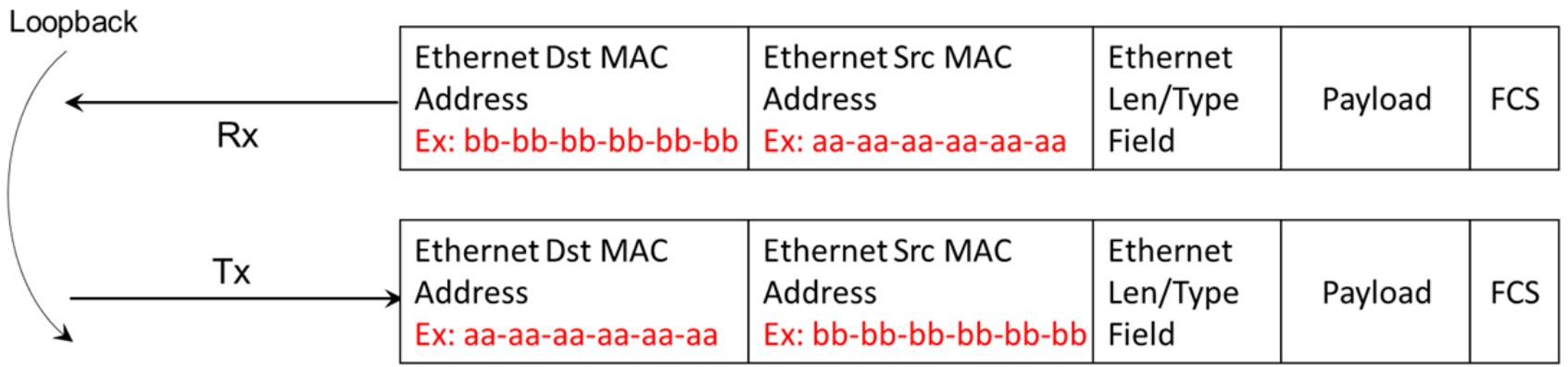
2 Ports BERT and Loopback

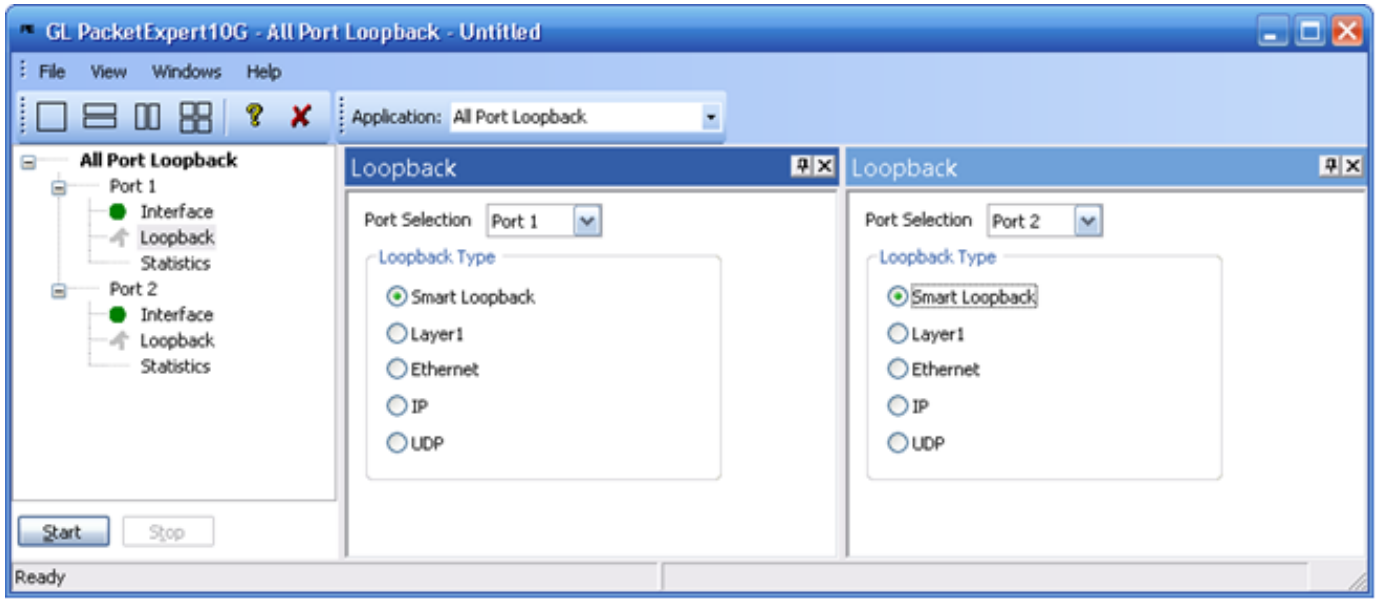
- Loopback helps in easy test setup, especially in end-to-end testing, when the other end is in a remote place
- In such cases, one PacketExpert™ 10GX can be put in constant Loopback at the remote end, and BERT tests can be started / stopped anytime at the local end



Layer 2 - Ethernet Loopback Types



- PacketExpert™ 10GX has all ports or 2 ports Loopback capability
- PacketExpert™ 10GX supports Layer-wise Loopback as well as Smart Loopback
- The Ethernet Loopback type, swaps Source and Destination MAC addresses before sending back the packet
- Supports Loopback on 10G / 1G ports
- Loopback Types – Smart Loopback, Layer 1, Ethernet, IP, UDP
- General statistics per port (similar to BERT port level statistics)



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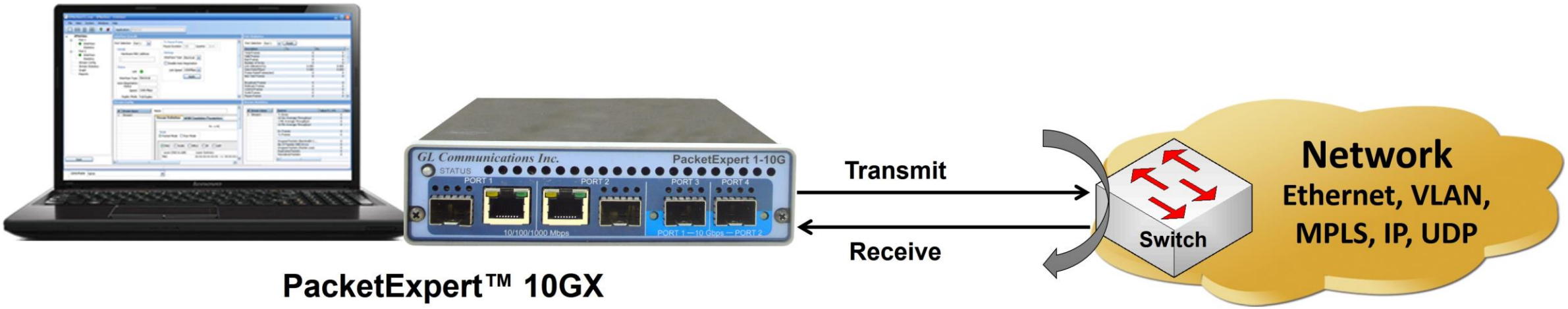
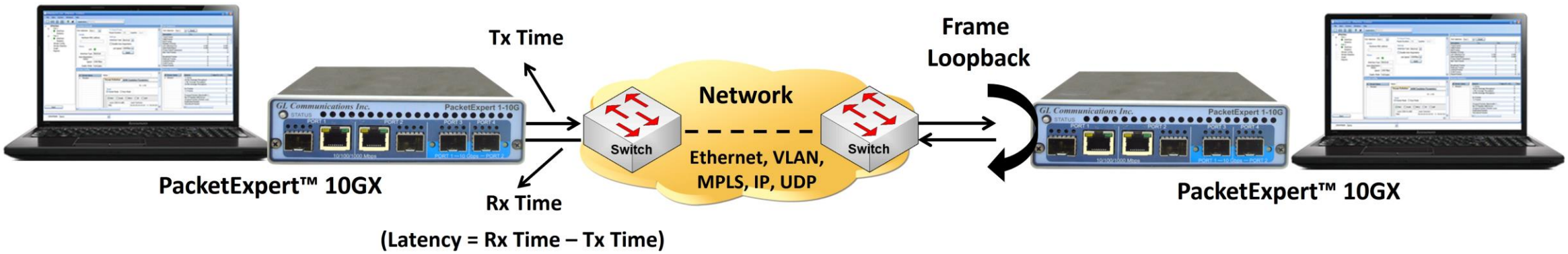
Dual RFC 2544 Testing



RFC 2544 test application includes the following tests:

- **Throughput** - Maximum number of frames per second that can be transmitted without any error
- **Latency** - Measures the time required for a frame to travel from the originating device through the network to the destination device
- **Frame Loss** - Measures the network's response in overload conditions
- **Back-to-Back** - It measures the maximum number of frames received at full line rate before a frame is lost

Single Port RFC 2544

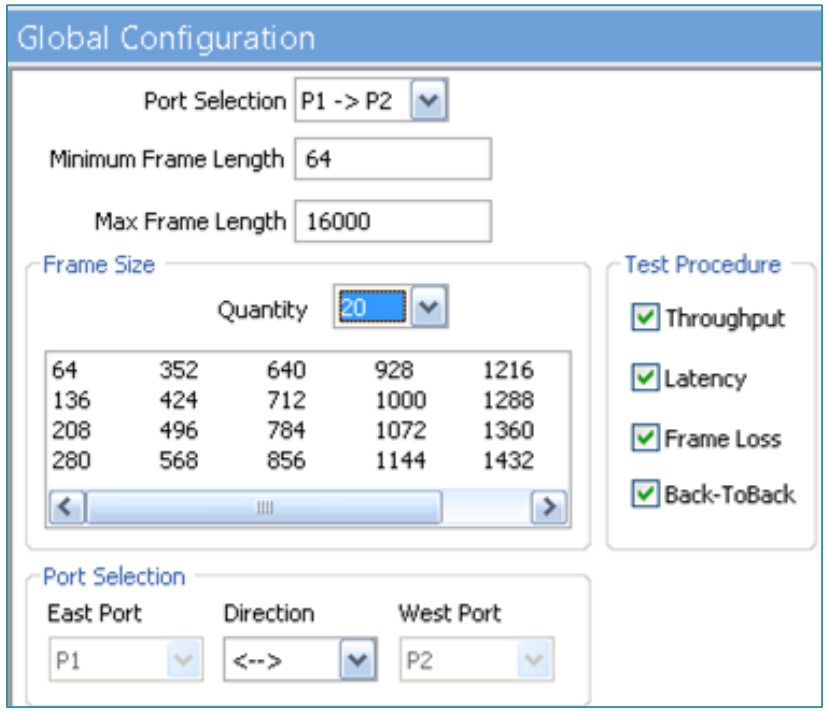


In single port RFC 2544 test,

- For PacketExpert™ 1G, the RFC 2544 test can be done either on Port #2 or Port #3 at a time and it is not possible to run RFC 2544 test on both the ports (Port #2, Port #3) simultaneously
- For PacketExpert™ 10G or 10GX, the RFC 2544 test can be done either on Port #1 or Port #2 at a time and it is not possible to run RFC 2544 test on both the ports (Port #1, Port #2) simultaneously

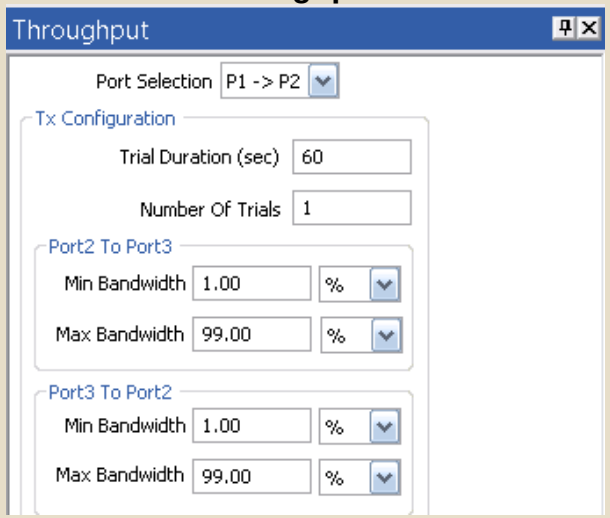
Configurations

Global Configuration

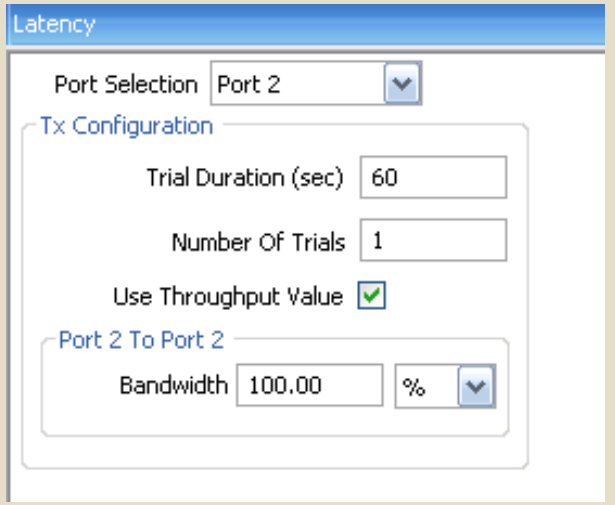


Individual Test Configuration Details

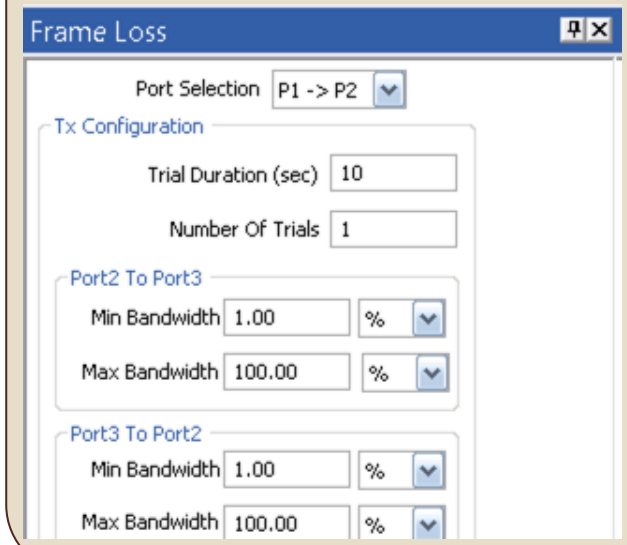
Throughput



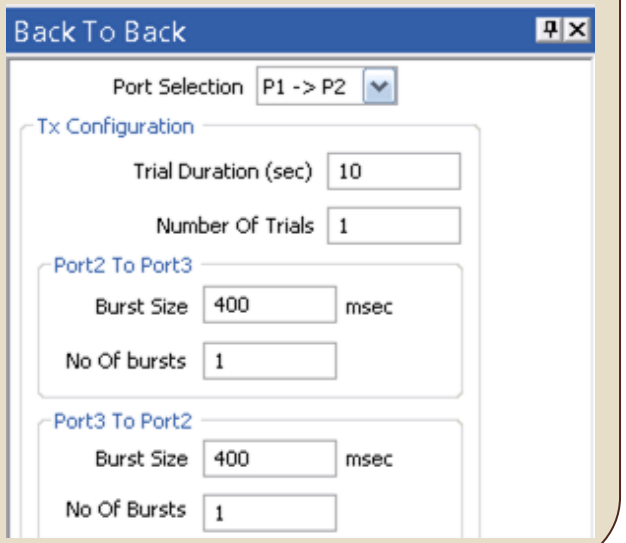
Latency



Frame Loss



Back-to-Back



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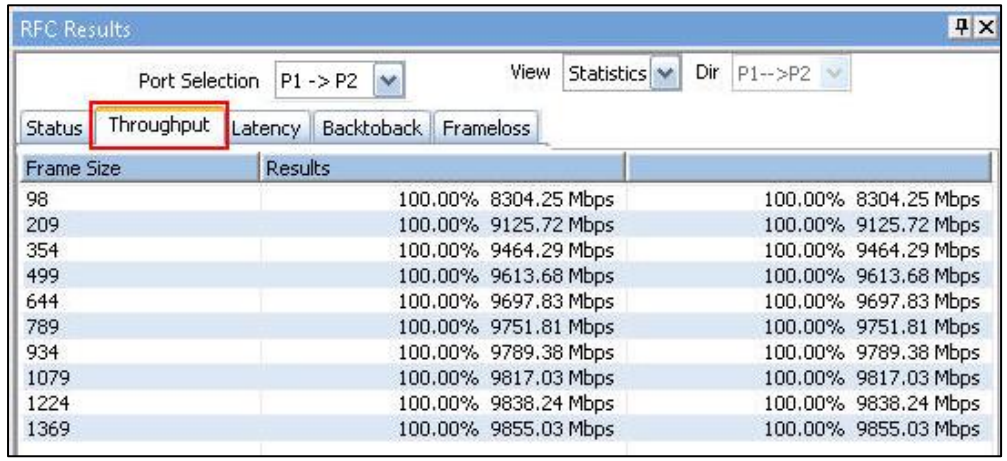
Results

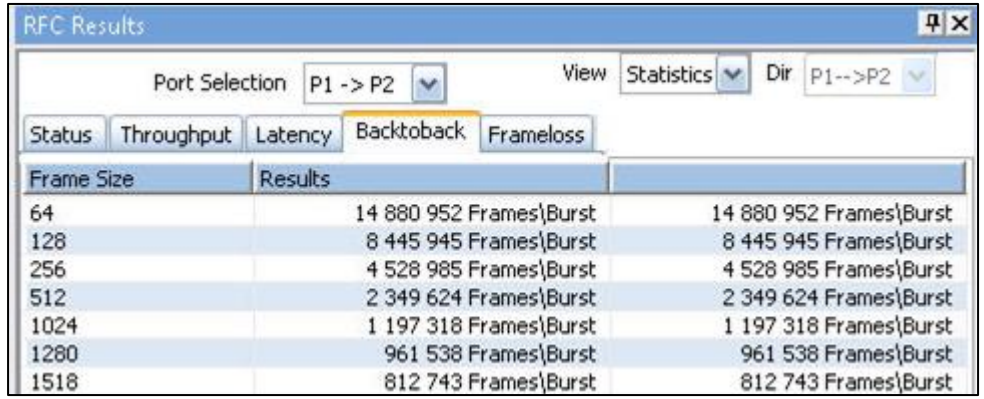
- **Throughput** – Both relative (% of link speed) and absolute (in Mbps) throughput values are displayed
- **Latency** – displayed in Microseconds
- **Back-to-Back** – Displayed in Frames/Burst
- **Frame Loss** – Displays the Frame Loss Rate (in %) against attempted Frame Rate (in % of link speed)


RFC Results

Port Selection: P1 -> P2 | View: Statistics | Dir: P1-->P2

Status | Throughput | Latency | Backtoback | Frameless

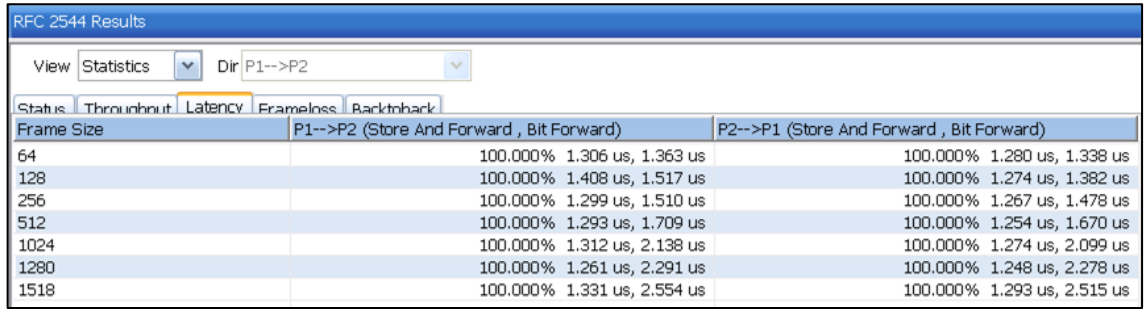
Frame Size	Results	
98	100.00% 8304.25 Mbps	100.00% 8304.25 Mbps
209	100.00% 9125.72 Mbps	100.00% 9125.72 Mbps
354	100.00% 9464.29 Mbps	100.00% 9464.29 Mbps
499	100.00% 9613.68 Mbps	100.00% 9613.68 Mbps
644	100.00% 9697.83 Mbps	100.00% 9697.83 Mbps
789	100.00% 9751.81 Mbps	100.00% 9751.81 Mbps
934	100.00% 9789.38 Mbps	100.00% 9789.38 Mbps
1079	100.00% 9817.03 Mbps	100.00% 9817.03 Mbps
1224	100.00% 9838.24 Mbps	100.00% 9838.24 Mbps
1369	100.00% 9855.03 Mbps	100.00% 9855.03 Mbps


RFC Results

Port Selection: P1 -> P2 | View: Statistics | Dir: P1-->P2

Status | Throughput | Latency | Backtoback | Frameless

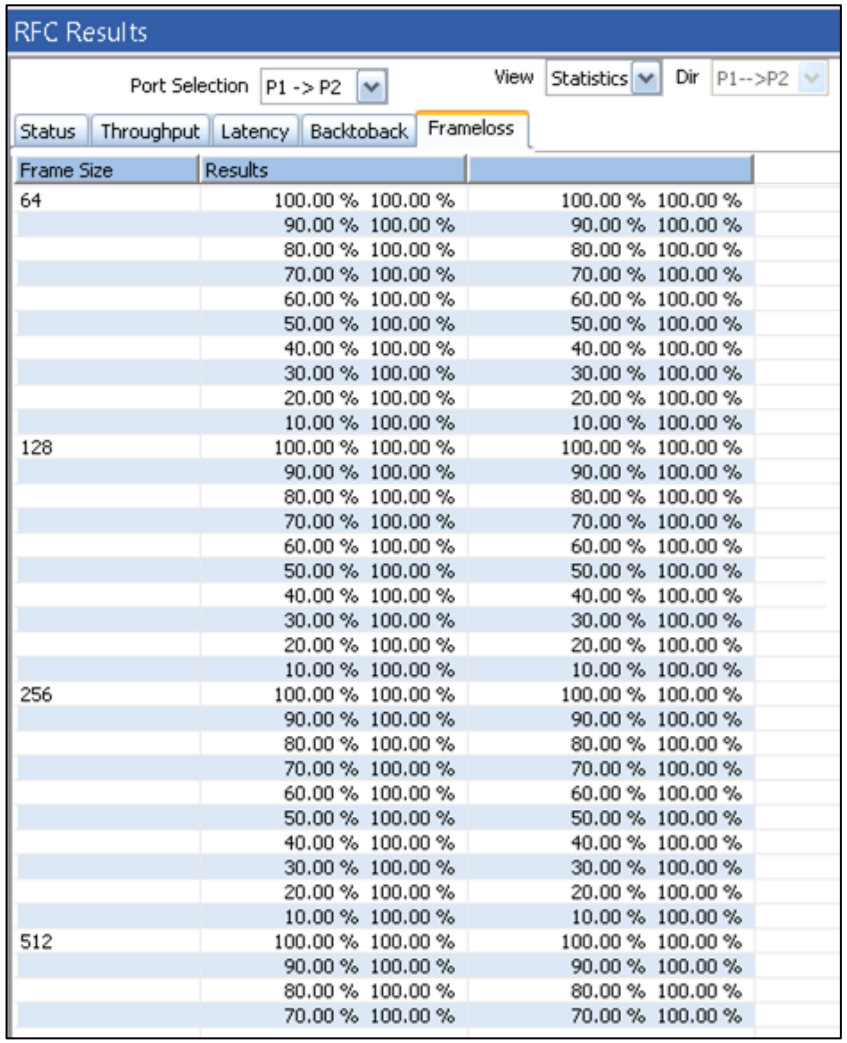
Frame Size	Results	
64	14 880 952 Frames\Burst	14 880 952 Frames\Burst
128	8 445 945 Frames\Burst	8 445 945 Frames\Burst
256	4 528 985 Frames\Burst	4 528 985 Frames\Burst
512	2 349 624 Frames\Burst	2 349 624 Frames\Burst
1024	1 197 318 Frames\Burst	1 197 318 Frames\Burst
1280	961 538 Frames\Burst	961 538 Frames\Burst
1518	812 743 Frames\Burst	812 743 Frames\Burst


RFC 2544 Results

View: Statistics | Dir: P1-->P2

Status | Throughput | Latency | Frameless | Backtoback

Frame Size	P1-->P2 (Store And Forward , Bit Forward)	P2-->P1 (Store And Forward , Bit Forward)
64	100.000% 1.306 us, 1.363 us	100.000% 1.280 us, 1.338 us
128	100.000% 1.408 us, 1.517 us	100.000% 1.274 us, 1.382 us
256	100.000% 1.299 us, 1.510 us	100.000% 1.267 us, 1.478 us
512	100.000% 1.293 us, 1.709 us	100.000% 1.254 us, 1.670 us
1024	100.000% 1.312 us, 2.138 us	100.000% 1.274 us, 2.099 us
1280	100.000% 1.261 us, 2.291 us	100.000% 1.248 us, 2.278 us
1518	100.000% 1.331 us, 2.554 us	100.000% 1.293 us, 2.515 us


RFC Results

Port Selection: P1 -> P2 | View: Statistics | Dir: P1-->P2

Status | Throughput | Latency | Backtoback | Frameless

Frame Size	Results	
64	100.00 % 100.00 %	100.00 % 100.00 %
	90.00 % 100.00 %	90.00 % 100.00 %
	80.00 % 100.00 %	80.00 % 100.00 %
	70.00 % 100.00 %	70.00 % 100.00 %
	60.00 % 100.00 %	60.00 % 100.00 %
	50.00 % 100.00 %	50.00 % 100.00 %
	40.00 % 100.00 %	40.00 % 100.00 %
	30.00 % 100.00 %	30.00 % 100.00 %
	20.00 % 100.00 %	20.00 % 100.00 %
	10.00 % 100.00 %	10.00 % 100.00 %
128	100.00 % 100.00 %	100.00 % 100.00 %
	90.00 % 100.00 %	90.00 % 100.00 %
	80.00 % 100.00 %	80.00 % 100.00 %
	70.00 % 100.00 %	70.00 % 100.00 %
	60.00 % 100.00 %	60.00 % 100.00 %
	50.00 % 100.00 %	50.00 % 100.00 %
	40.00 % 100.00 %	40.00 % 100.00 %
	30.00 % 100.00 %	30.00 % 100.00 %
	20.00 % 100.00 %	20.00 % 100.00 %
	10.00 % 100.00 %	10.00 % 100.00 %
256	100.00 % 100.00 %	100.00 % 100.00 %
	90.00 % 100.00 %	90.00 % 100.00 %
	80.00 % 100.00 %	80.00 % 100.00 %
	70.00 % 100.00 %	70.00 % 100.00 %
	60.00 % 100.00 %	60.00 % 100.00 %
	50.00 % 100.00 %	50.00 % 100.00 %
	40.00 % 100.00 %	40.00 % 100.00 %
	30.00 % 100.00 %	30.00 % 100.00 %
	20.00 % 100.00 %	20.00 % 100.00 %
	10.00 % 100.00 %	10.00 % 100.00 %
512	100.00 % 100.00 %	100.00 % 100.00 %
	90.00 % 100.00 %	90.00 % 100.00 %
	80.00 % 100.00 %	80.00 % 100.00 %
	70.00 % 100.00 %	70.00 % 100.00 %

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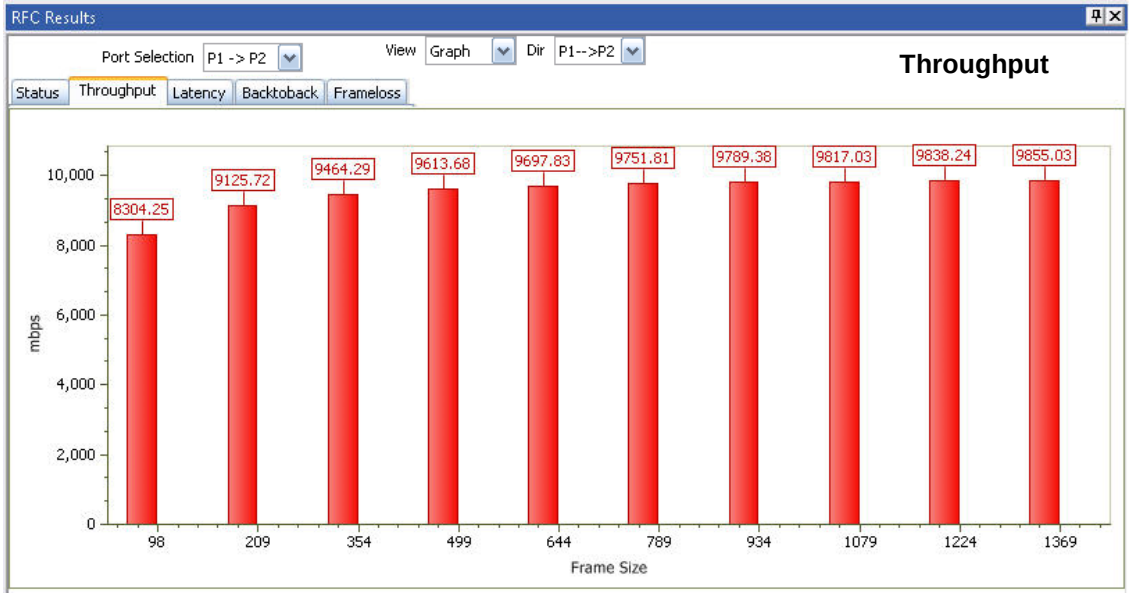
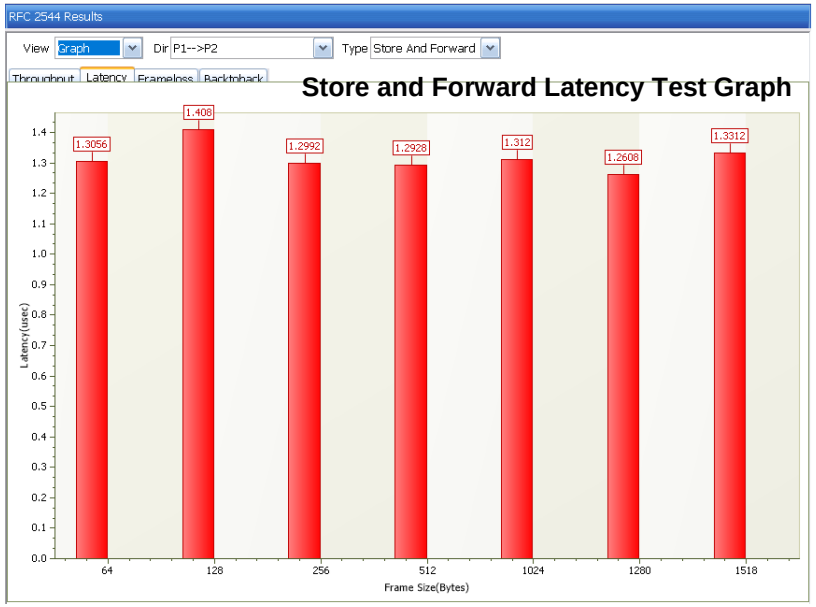
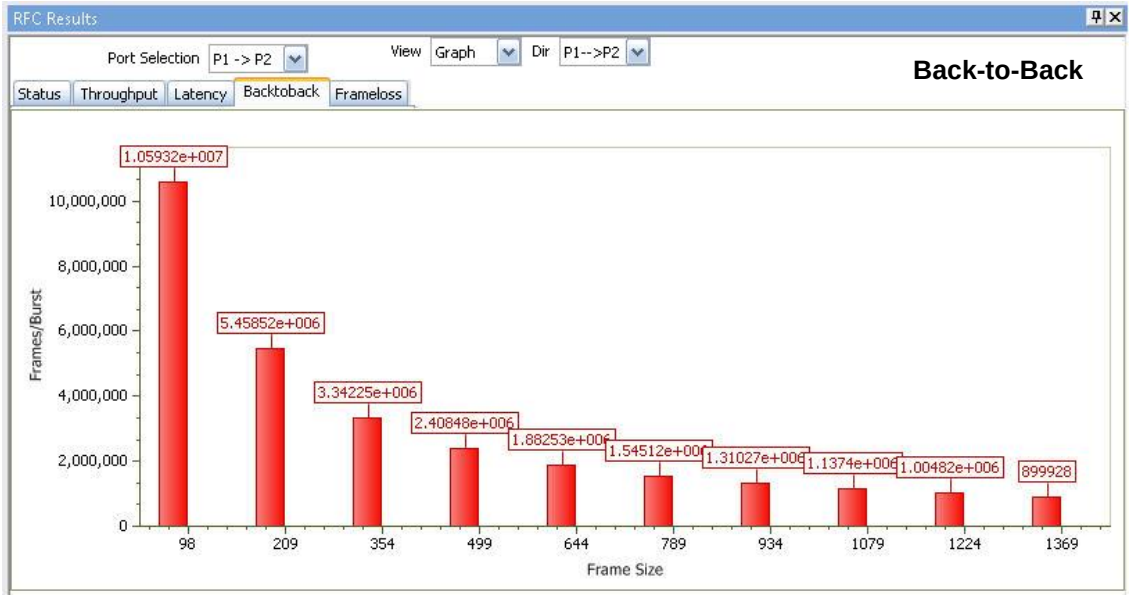
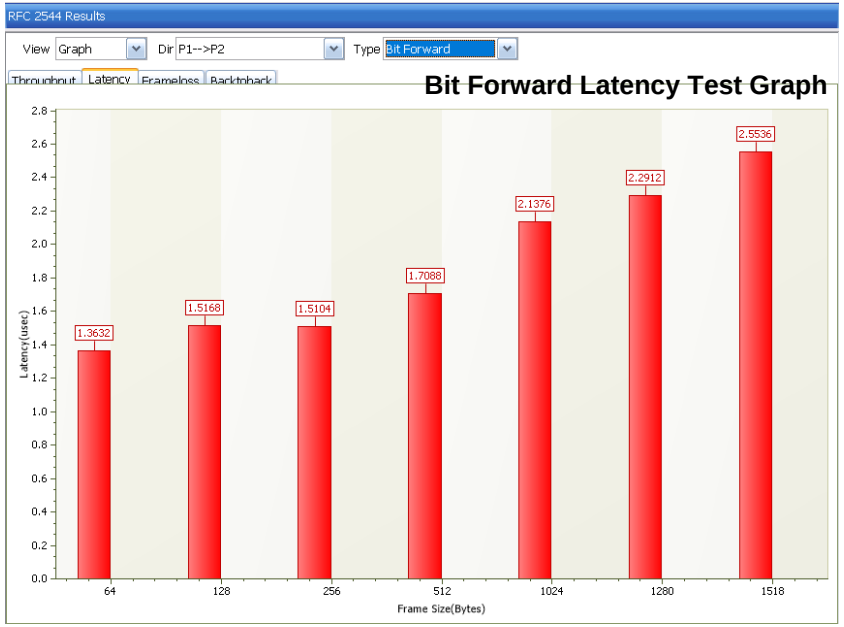
Graphs









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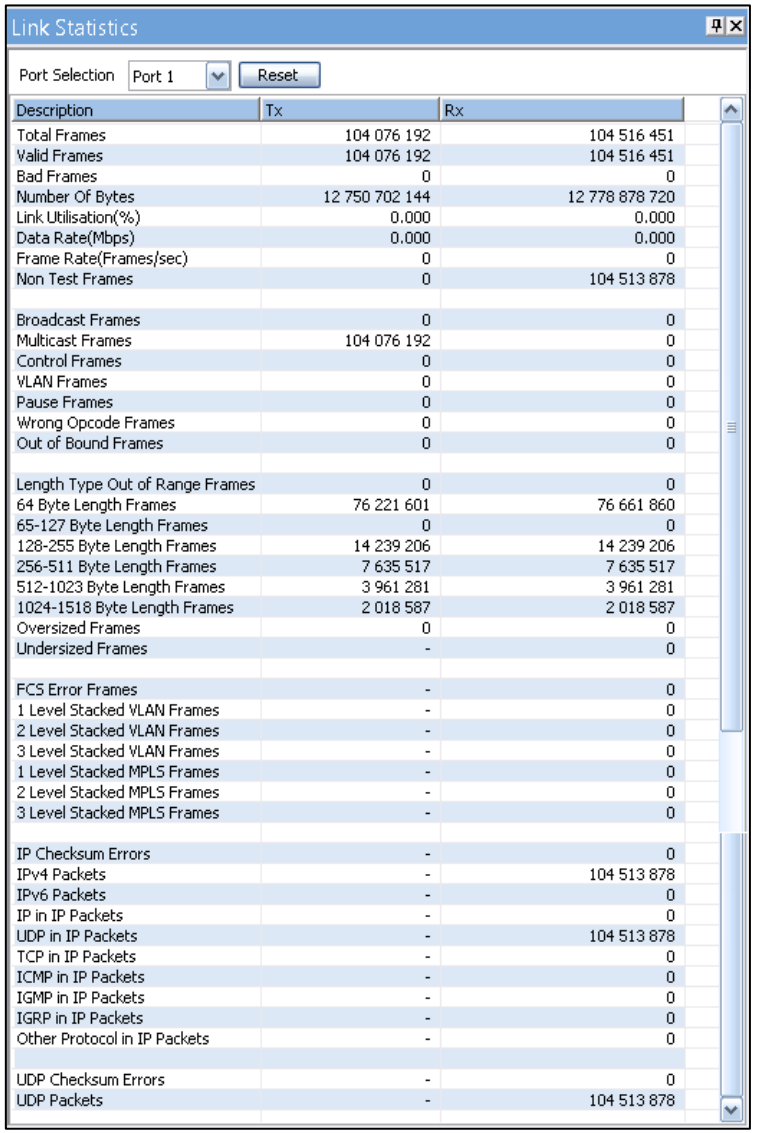
Port Statistics

- Per port detailed statistics are provided –
  - Tx / Rx Frame count
  - Number of Bytes transmitted & received
  - Tx & Rx Frame Rate
  - Broadcast, Multicast, Control, VLAN, Pause Frame count
  - Frame count for byte lengths 64/65-127
  - MPLS and VLAN Frame count for various stack level
  - IPv4/ UDP packet count
  - Oversized / Undersized Error frame count
  - FCS error count
  - IP/UDP checksum error count and others



Description	Tx	Rx
Total Frames	104 076 192	104 516 451
Valid Frames	104 076 192	104 516 451
Bad Frames	0	0
Number Of Bytes	12 750 702 144	12 778 878 720
Link Utilisation(%)	0.000	0.000
Data Rate(Mbps)	0.000	0.000
Frame Rate(Frames/sec)	0	0
Non Test Frames	0	104 513 878
Broadcast Frames	0	0
Multicast Frames	104 076 192	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	76 221 601	76 661 860
65-127 Byte Length Frames	0	0
128-255 Byte Length Frames	14 239 206	14 239 206
256-511 Byte Length Frames	7 635 517	7 635 517
512-1023 Byte Length Frames	3 961 281	3 961 281
1024-1518 Byte Length Frames	2 018 587	2 018 587
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	-	104 513 878
IPv6 Packets	-	0
IP in IP Packets	-	0
UDP in IP Packets	-	104 513 878
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	-	104 513 878

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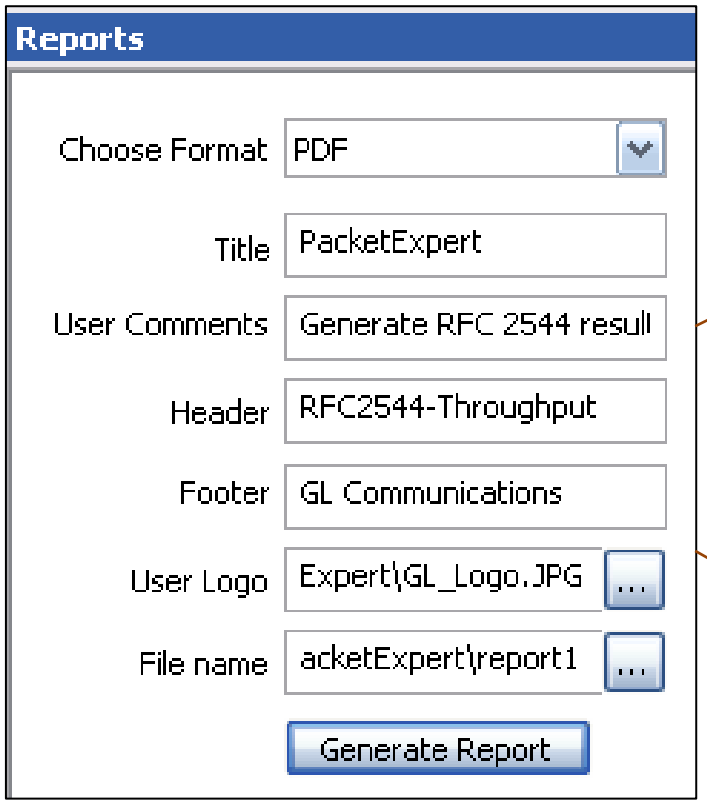
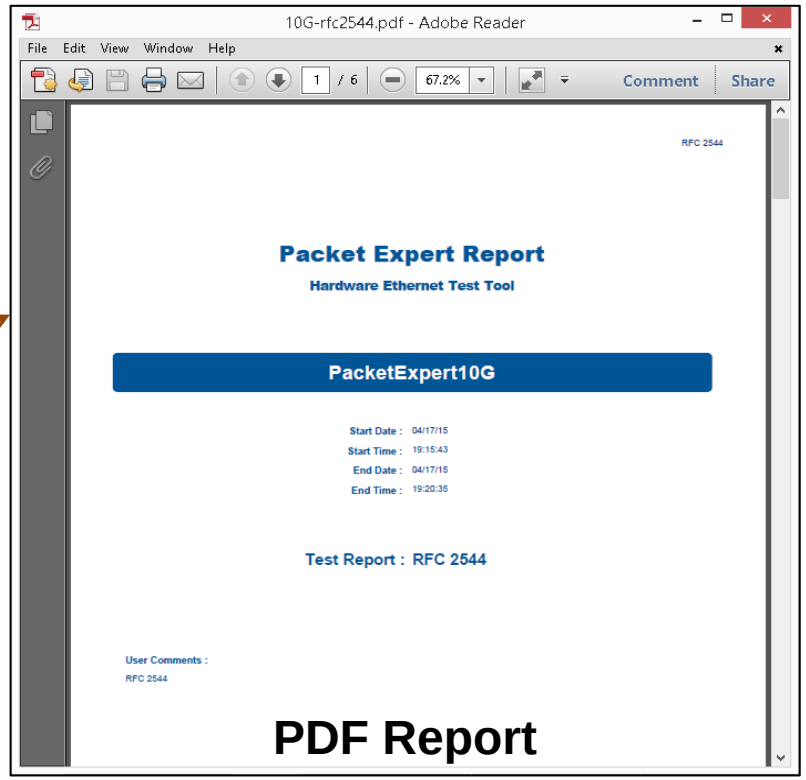
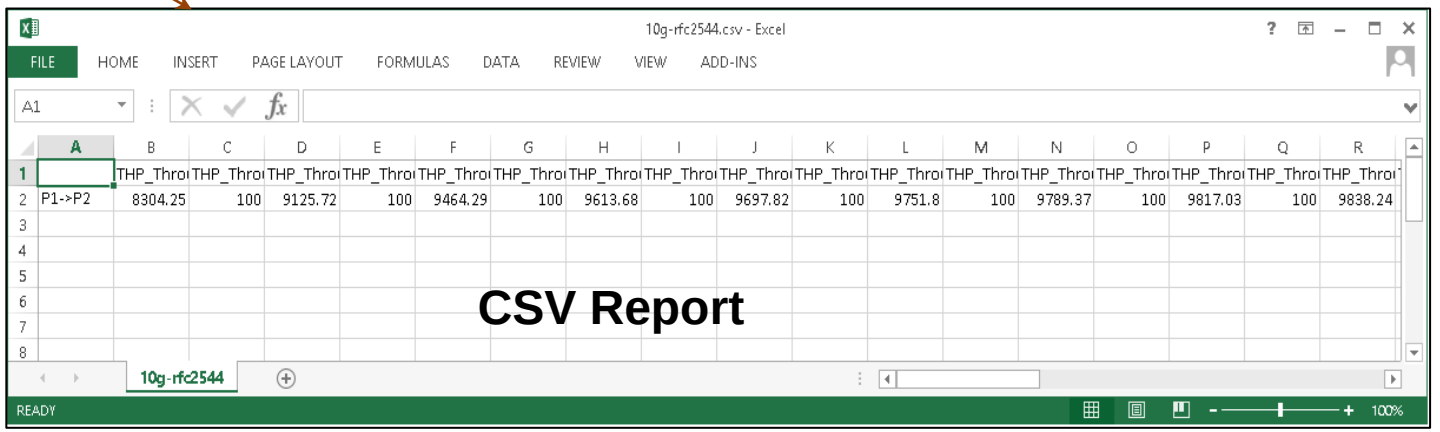
Generate Reports



Configuration



PDF Report



CSV Report

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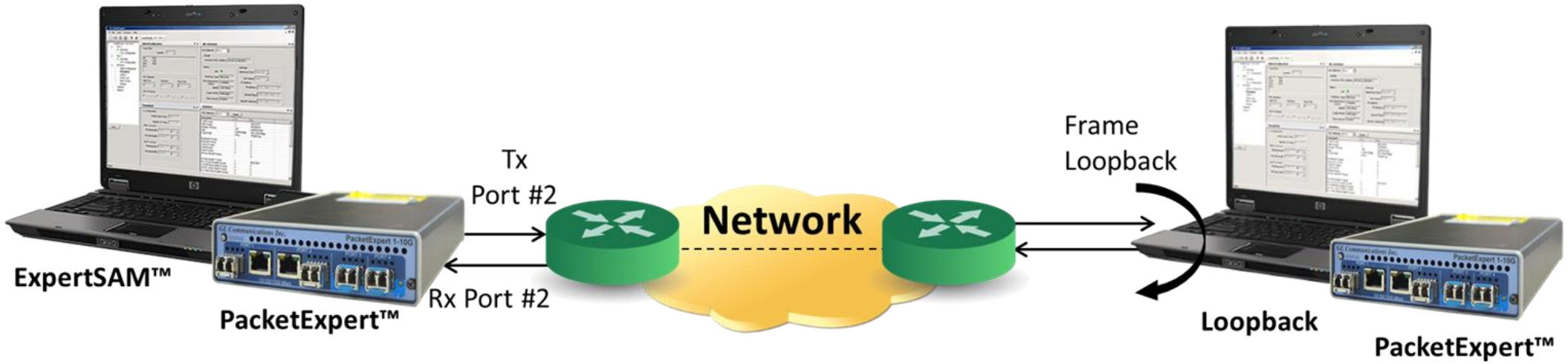
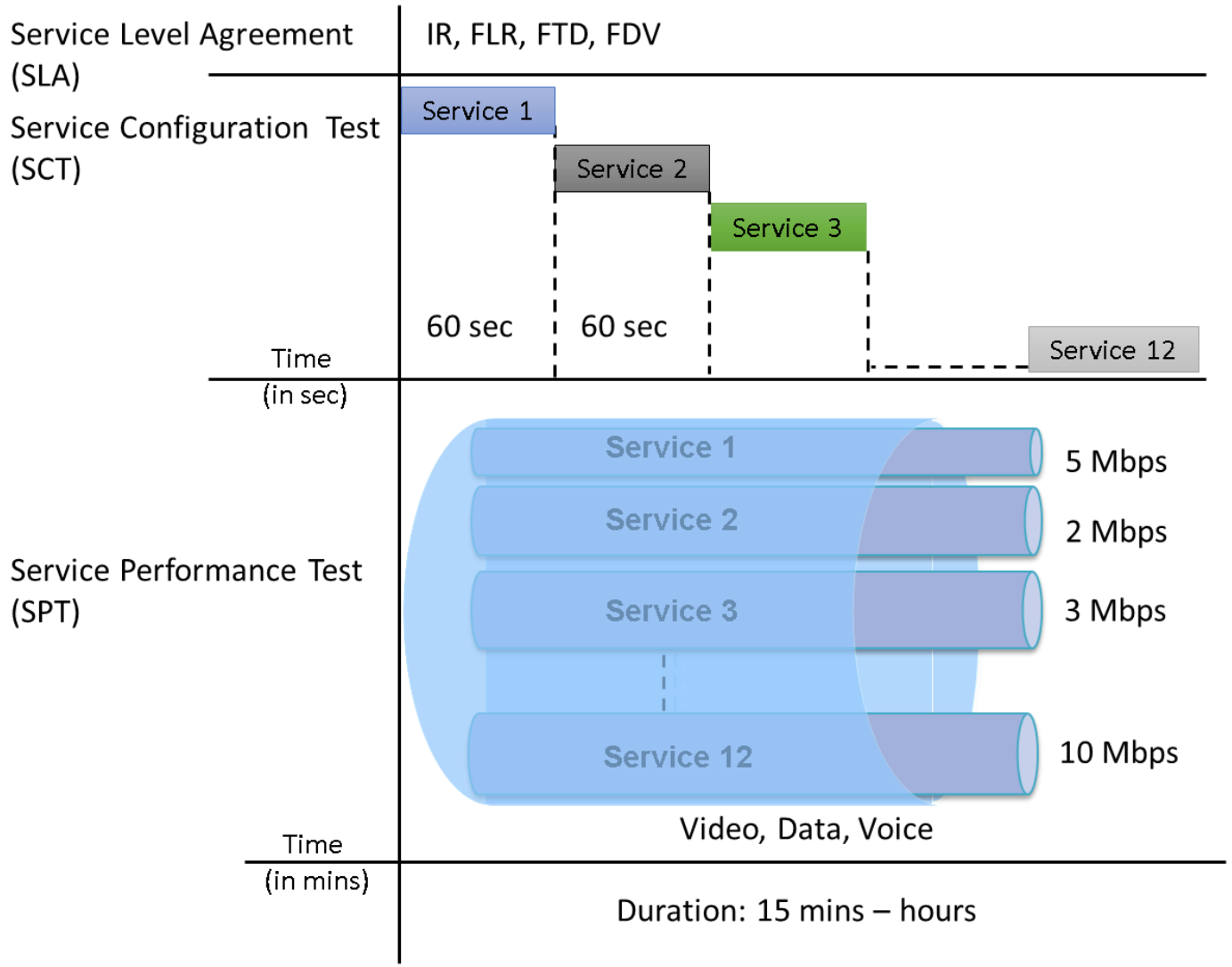
Ethernet Network Testing



- A single test to validate service-level agreements (SLAs) as per ITU-T Y.1564 standard
- ITU-T Y.1564 completes this testing in two phases based on the SLA parameters:
  - Service Level Agreement Parameters: Information Rate (IR), Frame Transfer Delay (FTD), Frame Delay Variation (FDV), Frame Loss Ratio (FLR)
  - Service Configuration Test
  - Service Performance Test

ITU-T Y.1564 (ExpertSAM™)

- **Service Configuration Test** - confirms the end-to-end configuration with the SLA parameters for all configured traffic streams
- **Service Performance Test** - transmits all configured traffic streams simultaneously CIR confirming all traffic is able to transverse the network under full load with the above-mentioned parameters



ITU-T Y.1564 (ExpertSAM™) Graph

- Committed information rate or CIR is the average bandwidth guaranteed by a service provider. At any given time, the bandwidth should not fall below this committed figure
- Excess Information Rate or EIR is the CIR plus excess rate that service provider claims to provide on a 'best-effort' basis

Service Performance and Configuration Test Results

Service Performance Results

IR(Mbps), FLR(%), FTD(msec), FDV(mse | Test Time | 12:06:55

Test	Verdict	IR (Curr)	IR (Min)	IR (Mean)	IR (Max)	FLR	FLR (Rate)	FTD (Curr)	FTD (Min)	FTD (Mean)	FTD (Max)	FDV (Curr)	FDV (Min)	FDV (Mean)	FDV (Max)
1	PASS	97.92	97.62	98.02	98.38	0	0.00	0.0992	0.0891	0.1148	0.1027	0.001521	0.001500	0.001564	0.001645
2	PASS	48.92	48.79	49.01	49.24	0	0.00	0.1020	0.0000	0.6723	0.1020	0.002252	0.002157	0.002239	0.002354
3	PASS	206.04	205.35	205.81	206.33	0	0.00	0.0992	0.0889	0.1039	0.1030	0.000924	0.000902	0.000934	0.000989
4	PASS	68.50	68.29	68.60	68.90	0	0.00	0.0992	0.0916	0.1020	0.1030	0.001921	0.001838	0.001920	0.002037
5	PASS	88.34	87.85	88.19	88.47	0	0.00	0.0992	0.0924	0.1005	0.1030	0.001688	0.001615	0.001673	0.001767
6	PASS	39.23	38.99	39.19	39.39	0	0.00	0.0992	0.0906	0.1025	0.1030	0.002453	0.002330	0.002437	0.002617
7	PASS	34.44	34.09	34.30	34.49	0	0.00	0.0992	0.0937	0.1023	0.1030	0.002569	0.002393	0.002541	0.002669
8	PASS	49.22	48.82	49.03	49.24	0	0.00	0.0992	0.0908	0.1022	0.1030	0.002290	0.002142	0.002235	0.002369
9	PASS	53.90	53.67	53.90	54.14	0	0.00	0.0992	0.0876	0.1019	0.1030	0.002162	0.002049	0.002146	0.002291
10	PASS	68.68	68.24	68.60	68.87	0	0.00	0.0992	0.0907	0.1002	0.1030	0.001914	0.001854	0.001925	0.002025
11	PASS	146.84	146.57	146.95	147.49	0	0.00	0.0992	0.0902	0.0983	0.1027	0.001218	0.001170	0.001213	0.001288
12	PASS	78.27	78.12	78.38	78.75	0	0.00	0.0992	0.0906	0.1001	0.1030	0.001785	0.001710	0.001786	0.001881

Service Performance Test Done

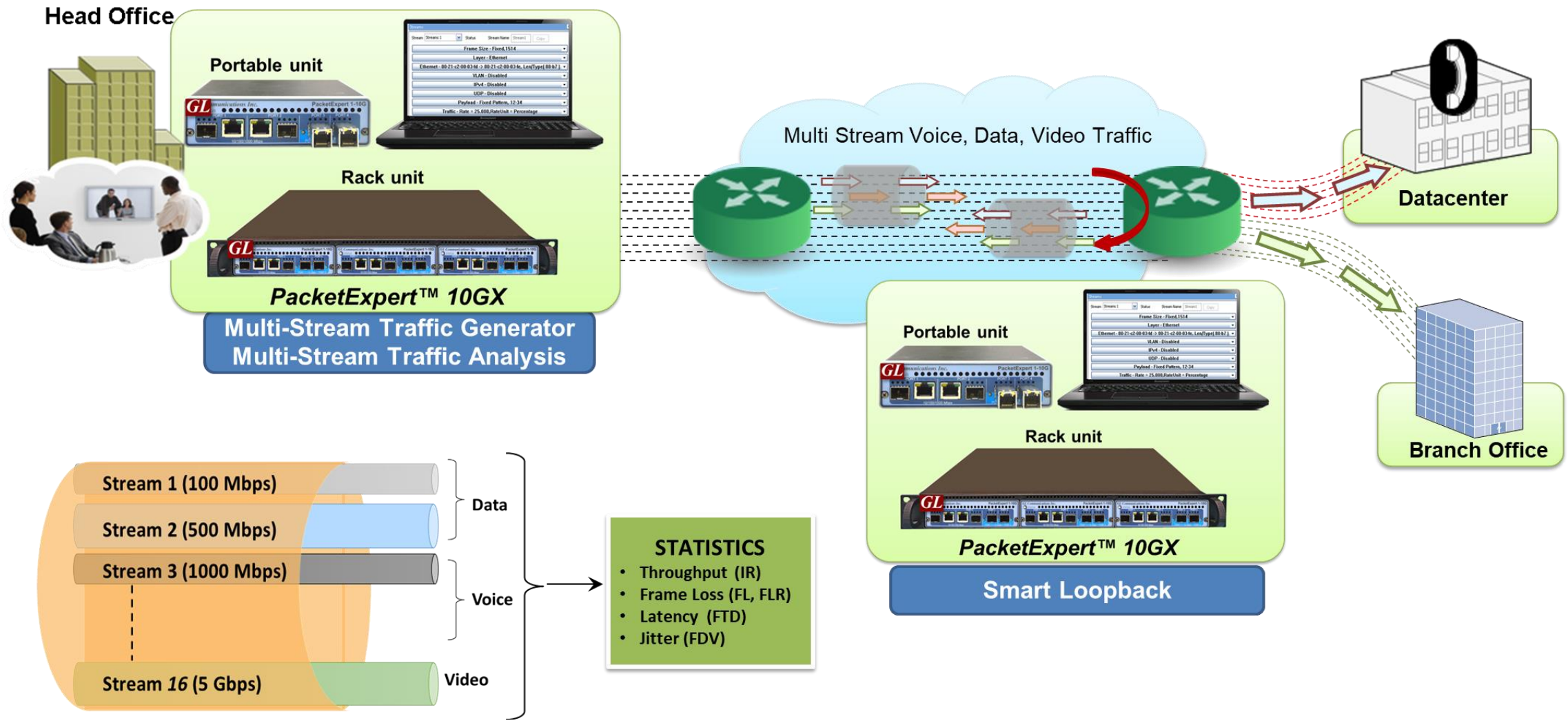
Service Configuration Results Overview

Overview

#	Service Name	Verdict	Current Step	Max IR(Mbps)	FLR(%)	Max FTD(msec)	Max FDV(msec)
1	Service1	✓	-	625.00	0.000	0.0014	0.000038
2	Service2	✓	-	625.00	0.000	0.0014	0.000038
3	Service3	✓	-	625.00	0.000	0.0014	0.000038
4	Service4	✓	-	625.00	0.000	0.0014	0.000038
5	Service5	✓	-	625.00	0.000	0.0014	0.000038
6	Service6	✓	-	625.00	0.000	0.0014	0.000038
7	Service7	✓	-	625.00	0.000	0.0014	0.000038
8	Service8	✓	-	625.00	0.000	0.0014	0.000038
9	Service9	✓	-	625.00	0.000	0.0014	0.000038
10	Service10	✓	-	625.00	0.000	0.0014	0.000038
11	Service11	✓	-	625.00	0.000	0.0014	0.000038
12	Service12	✓	-	625.00	0.000	0.0014	0.000038
13	Service13	✓	-	625.00	0.000	0.0014	0.000038
14	Service14	✓	-	625.00	0.000	0.0014	0.000038
15	Service15	✓	-	625.00	0.000	0.0014	0.000038
16	Service16	✓	-	625.00	0.000	0.0014	0.000038

GL Communications

Multi-Stream Traffic Generator and Analyzer
(1 Gbps, 2.5 Gbps, or 10 Gbps)



Multi-Stream Traffic Generator and Analyzer Results

Multi-Stream Traffic Generator & Analyzer Results

IR(Mbps), FLR(%), FTD(msec), FDV(msec) | Test Time 00:00:53 | Vertical |||| | FTD Unit msec | FDV Unit msec | Activate All | DeActivate All

Stream No	Seconds	TxFrames	RxFrames	RxBytes	FL Count	FLR	IR (Curr)	IR (Min)	IR (Max)	IR (Avg)	FTD	FTD	FTD	FTD	FDV (Curr)
☑ 1	55	1 146 226	1 125 387	679 852 618	20 839	1.818	104.05	104.03	104.06	133.78	0.002	0.001	0.003	0.002	< 1us
☑ 2	55	1 278 940	1 255 686	642 911 232	23 254	1.818	98.97	98.94	98.97	127.24	0.002	0.001	0.003	0.002	< 1us
☑ 3	55	5 832 149	5 726 109	7 902 030 420	106 040	1.818	1187.65	1187.30	1187.65	1526.96	0.002	0.002	0.003	0.002	< 1us
☑ 4	55	1 214 894	1 192 804	1 646 069 520	22 090	1.818	247.40	247.33	247.41	318.08	0.002	0.002	0.003	0.002	< 1us
☑ 5	55	155 163	152 342	157 521 628	2 821	1.818	23.79	23.79	23.80	30.58	0.002	0.002	0.003	0.002	< 1us
☑ 6	55	18 212 176	17 881 043	2 324 535 590	331 133	1.818	397.36	397.24	397.36	510.89	0.002	0.001	0.003	0.002	< 1us
☑ 7	55	14 585 983	14 320 782	19 762 679 160	265 201	1.818	2970.25	2969.39	2970.26	3818.88	0.002	0.002	0.003	0.002	< 1us
☑ 8	55	5 216 779	5 121 928	5 244 854 272	94 851	1.818									
☑ 9	55	1 535 124	1 507 212	771 692 544	27 912	1.818									
☑ 10	55	3 434 715	3 372 265	674 453 000	62 450	1.818									
☑ 11	55	3 176 550	3 118 794	405 443 220	57 756	1.818									
☑ 12	55	9 085 290	8 920 101	1 159 613 130	165 189	1.818									
☑ 13	55	9 844 599	9 665 605	5 841 891 662	178 994	1.818									
☑ 14	55	27 539 785	27 039 059	16 342 406 346	500 726	1.818									
☑ 15	55	395 501	388 310	793 705 640	7 191	1.818									
☑ 16	55	1 090 764	1 090 764	658 606 880	0	0.000									

Horizontal View

Multi-Stream Traffic Generator & Analyzer Results

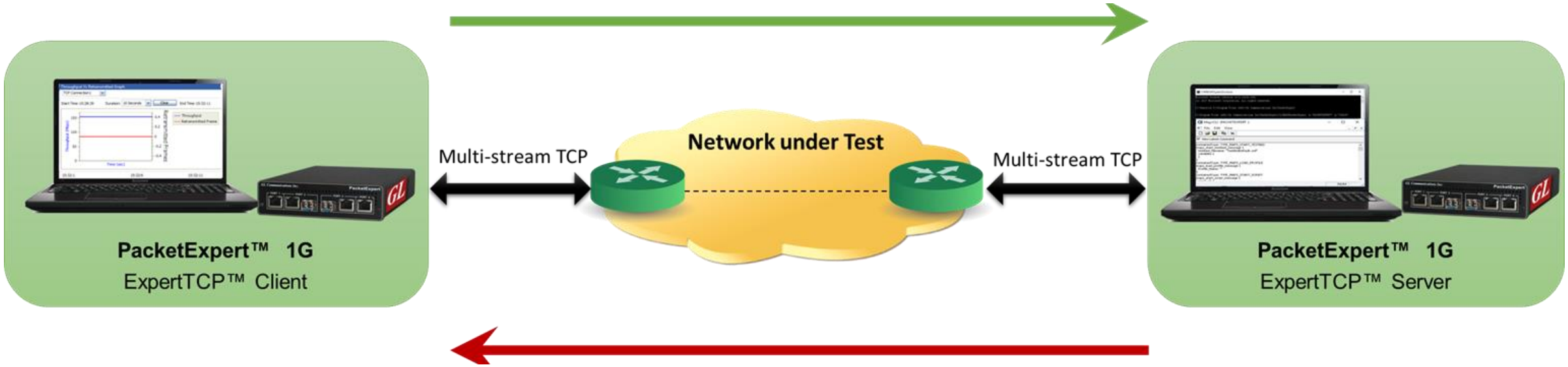
IR(Mbps), FLR(%), FTD(msec), FDV(msec) | Test Time 00:01:55 | Horizontal--- | FTD Unit msec | FDV Unit msec | Activate All | DeActivate All

Stream No.	1	2	3	4	5	6	7	8	9	10	11
Stream Sel...	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Seconds	117	117	117	117	117	117	117	117	117	117	117
TxFrames	2 438 342	2 720 661	12 406 605	2 584 417	330 075	38 742 374	31 028 451	11 097 542	3 265 635	7 306 595	6 757 407
RxFrames	2 438 342	2 720 661	12 406 605	2 584 417	330 075	38 742 374	31 028 451	11 097 542	3 265 635	7 306 595	6 757 407
RxBytes	1 473 018 618	1 392 978 432	17 121 114	3 566 495 460	341 297 550	5 036 508 620	42 819 262	11 363 883	1 672 005 120	1 461 319 000	878 462 910
FL Count	0	0	0	0	0	0	0	0	0	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
IR (Curr)	104.05	98.97	1187.65	247.40	23.79	397.36	2970.26	792.20	118.79	109.91	69.31
IR (Min)	104.03	98.94	1187.30	247.33	23.79	397.24	2969.39	791.97	118.76	109.88	69.29
IR (Max)	104.06	98.97	1187.65	247.41	23.80	397.36	2970.26	792.20	118.79	109.91	69.31
IR (Avg)	136.79	130.10	1561.28	325.23	31.27	522.37	3904.70	1041.42	156.16	144.49	91.11
FTD (Curr)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
FTD (Min)	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.001
FTD (Max)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
FTD (Avg)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
FDV (Curr)	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us
FDV (Min)	0.000	0.000	0.000	< 1us	< 1us	0.000	0.000	0.000	0.000	0.000	0.000
FDV (Max)	0.001	0.001	< 1us	< 1us	< 1us	0.001	< 1us	< 1us	0.001	0.001	0.001
FDV (Avg)	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us

Vertical View

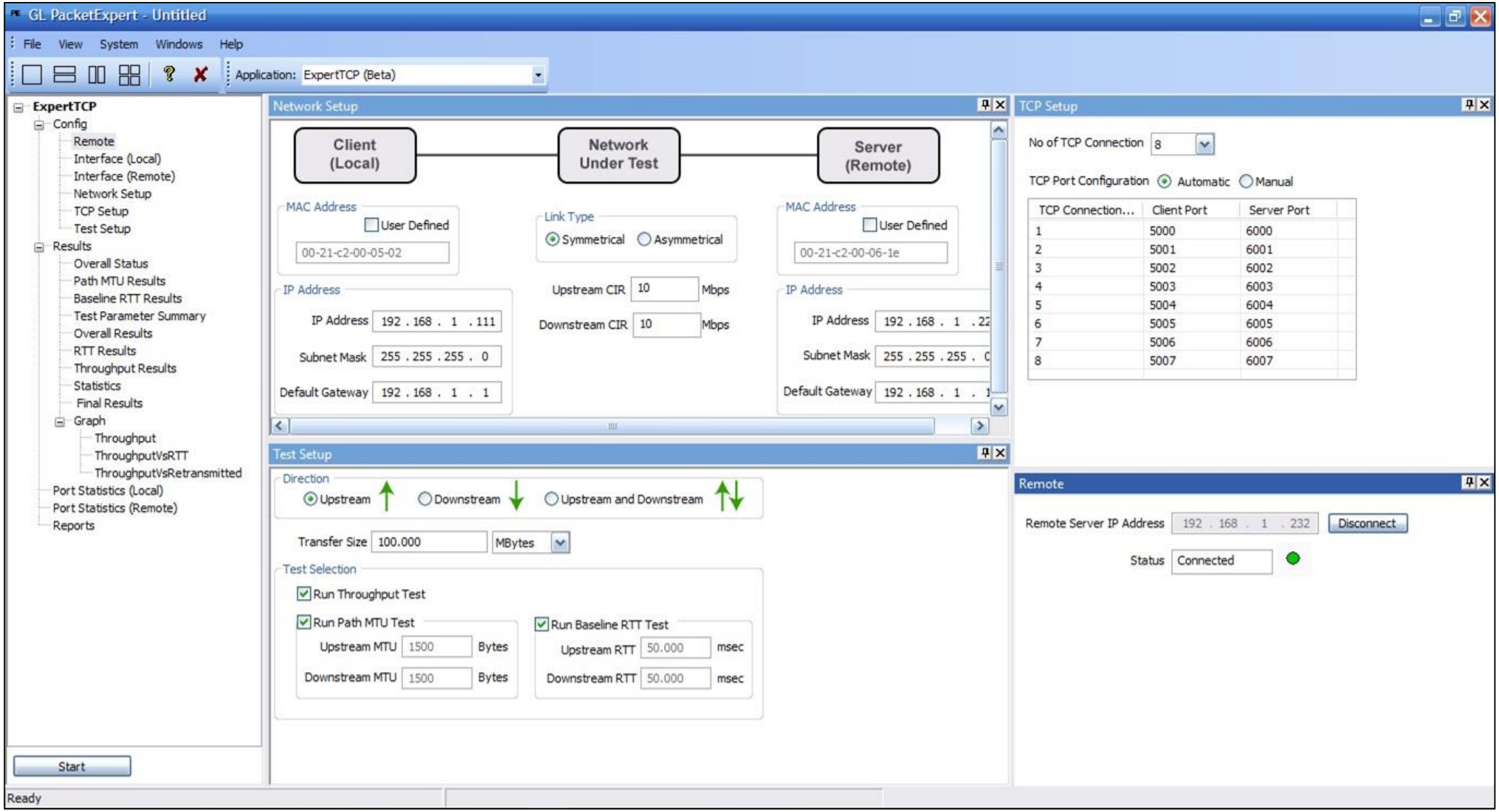
GL Communications

ExpertTCP™ (RFC-6349 Testing)



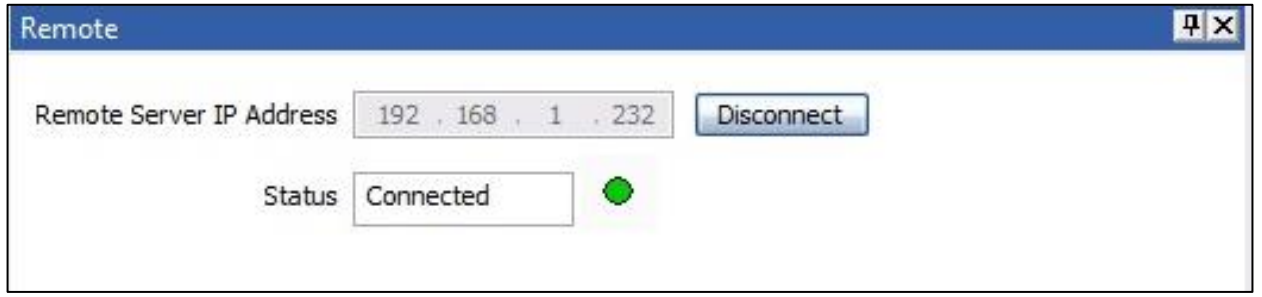
GL Communications

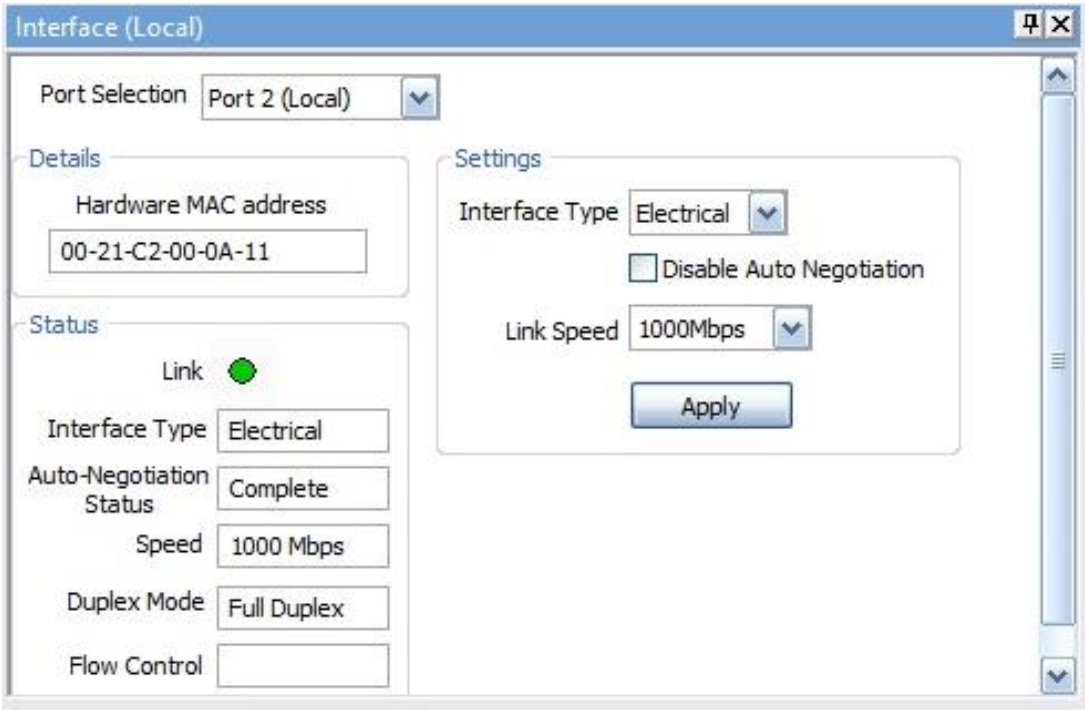
ExpertTCP™ Main Screen

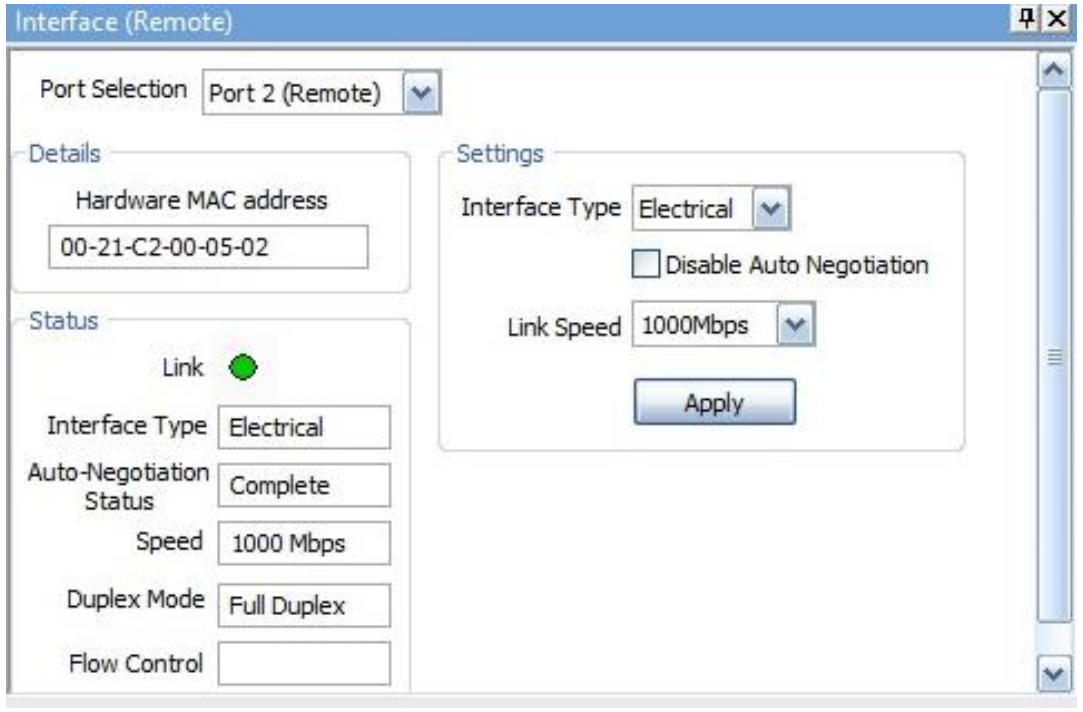


Network Setup

All settings configured locally on the client side

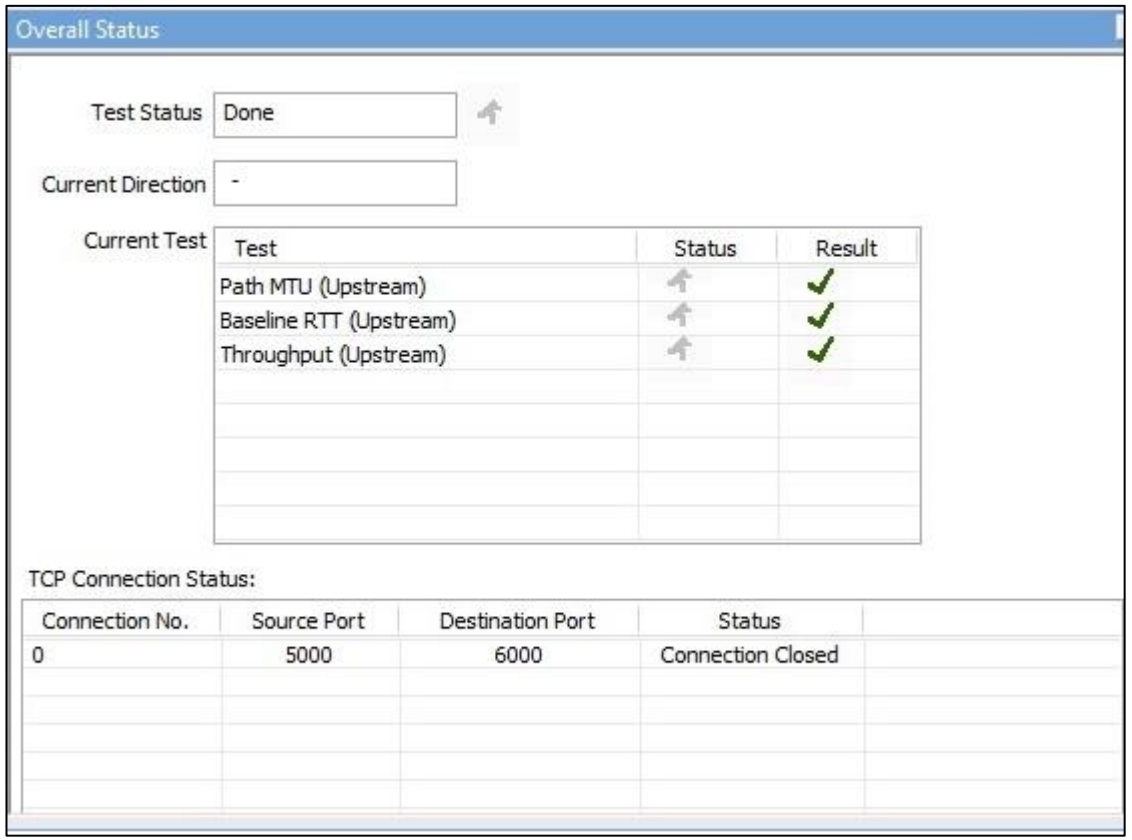


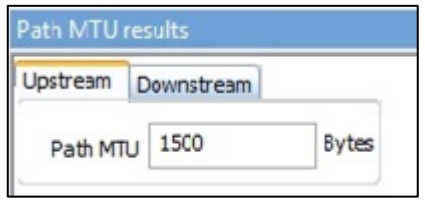


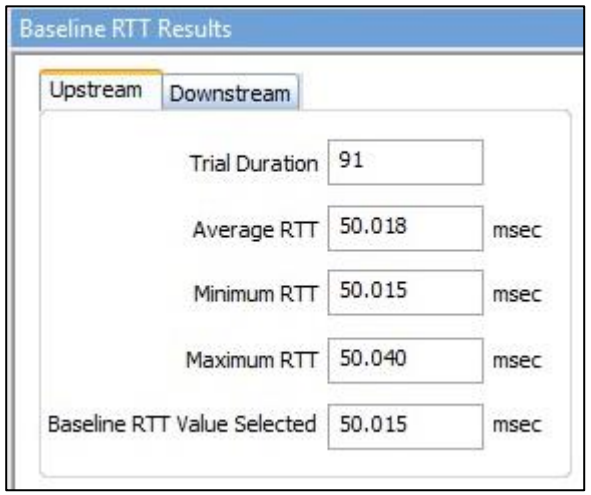


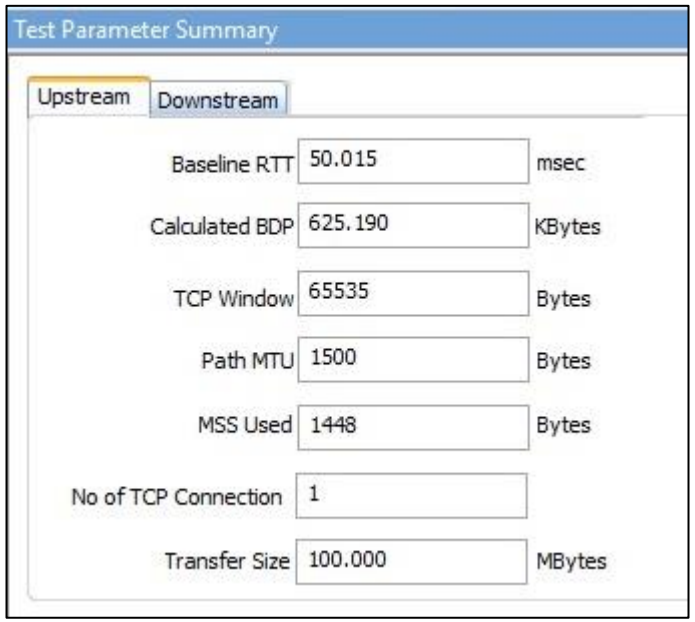
GL Communications

Status and Results







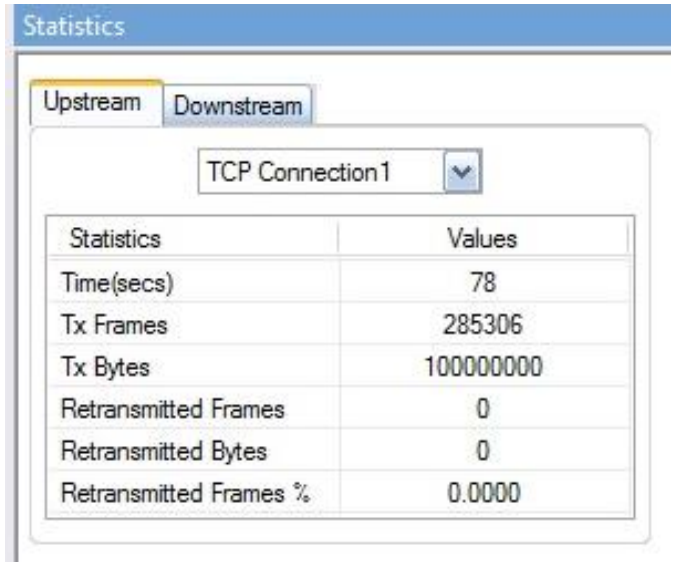


GL Communications

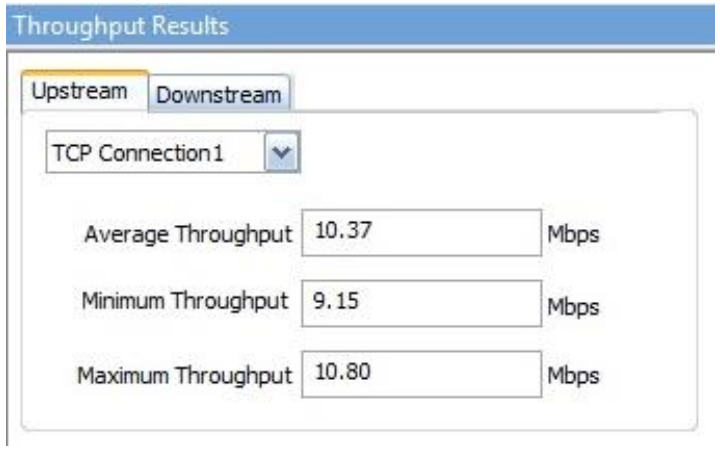
Statistics and Periodic Results

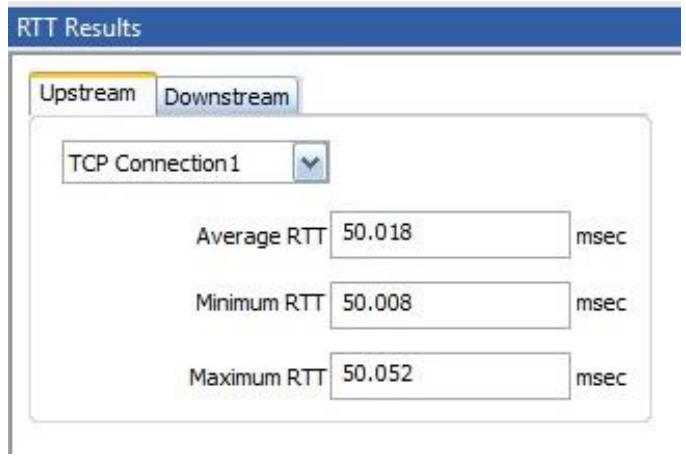
Statistics are updated every second and includes -

- TCP Transmitted Frames/Bytes
- TCP Retransmitted Frames/Bytes
- Retransmitted Bytes Percentage



Throughput and RTT values are calculated every second and displayed. Minimum, Maximum and Average Values are displayed





GL Communications

Final Results

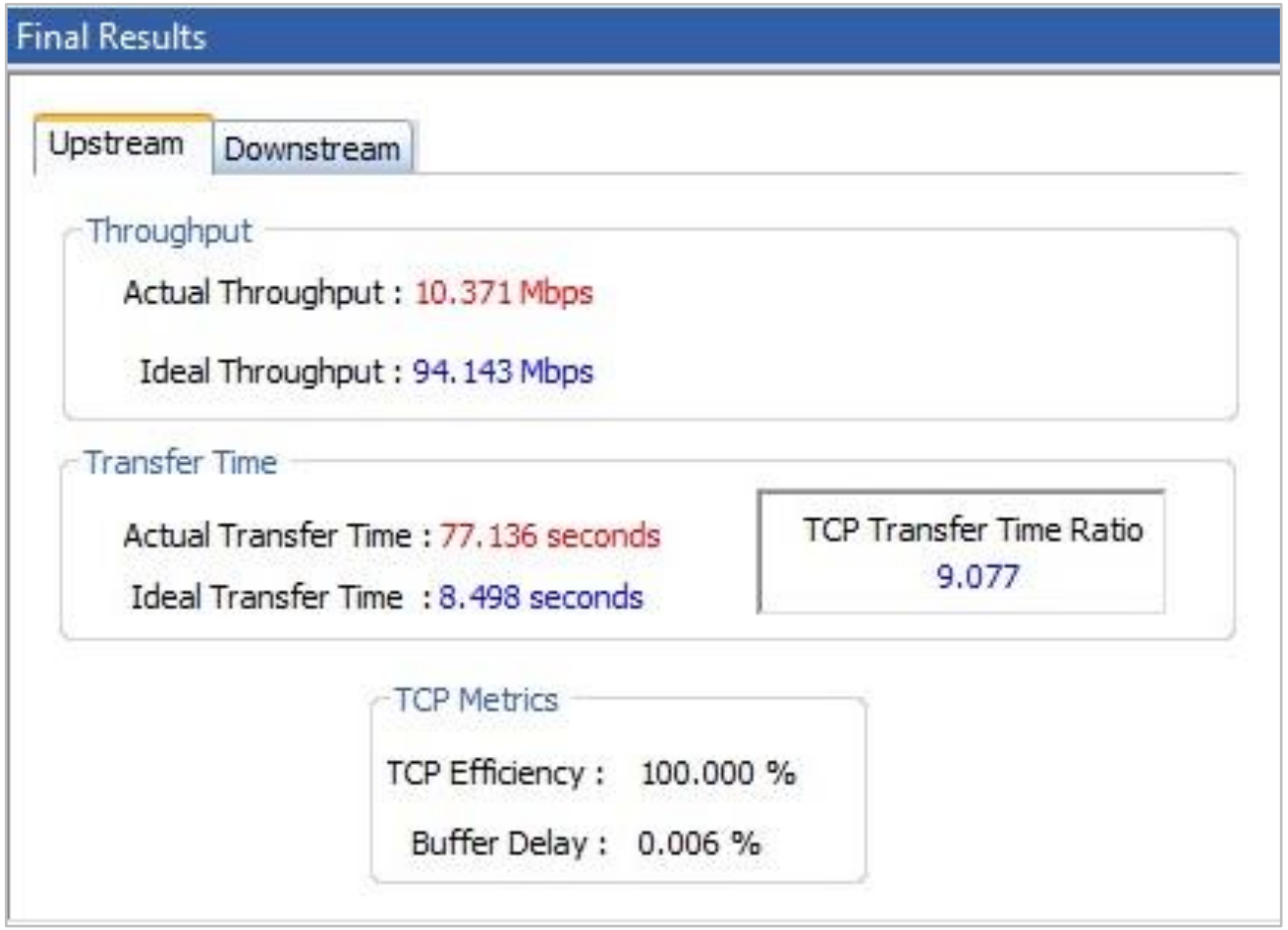
Ideal Throughput - the maximum possible TCP throughput for the given CIR

Ideal Transfer Time - the time taken to transfer the test data size at the ideal throughput

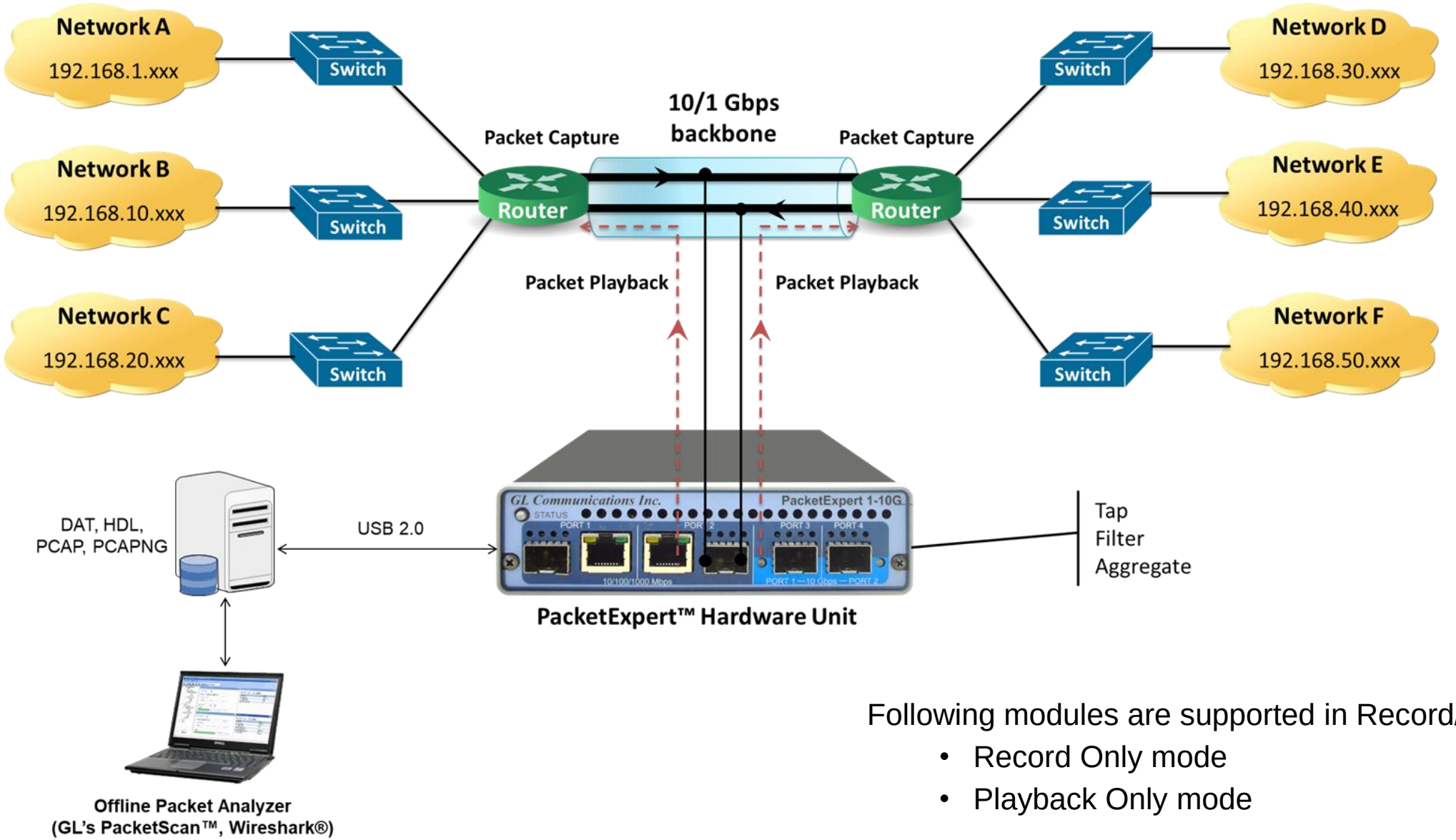
TCP Transfer Time Ratio - Measure of how much Actual transfer time is greater than the Ideal transfer time

TCP Efficiency - measure of the number of Transmitted bytes compared to the retransmitted bytes

Buffer Delay - measure of how much the RTT increases during the actual TCP Throughput test compared to the Baseline RTT



Wire-Speed Record/Playback

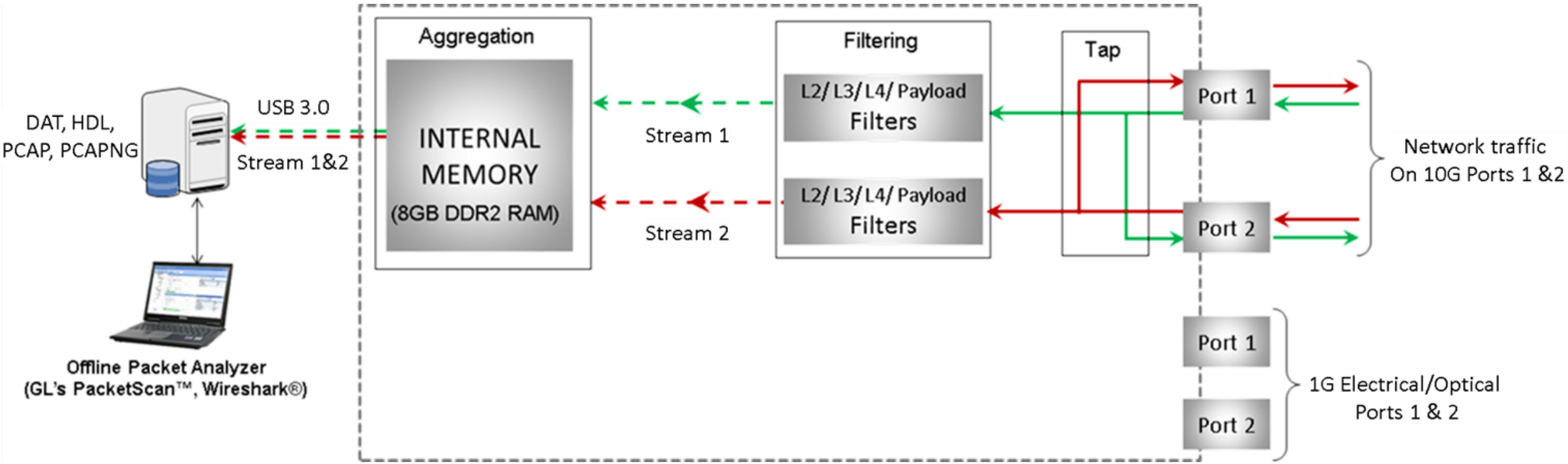


Following modules are supported in Record/Playback:

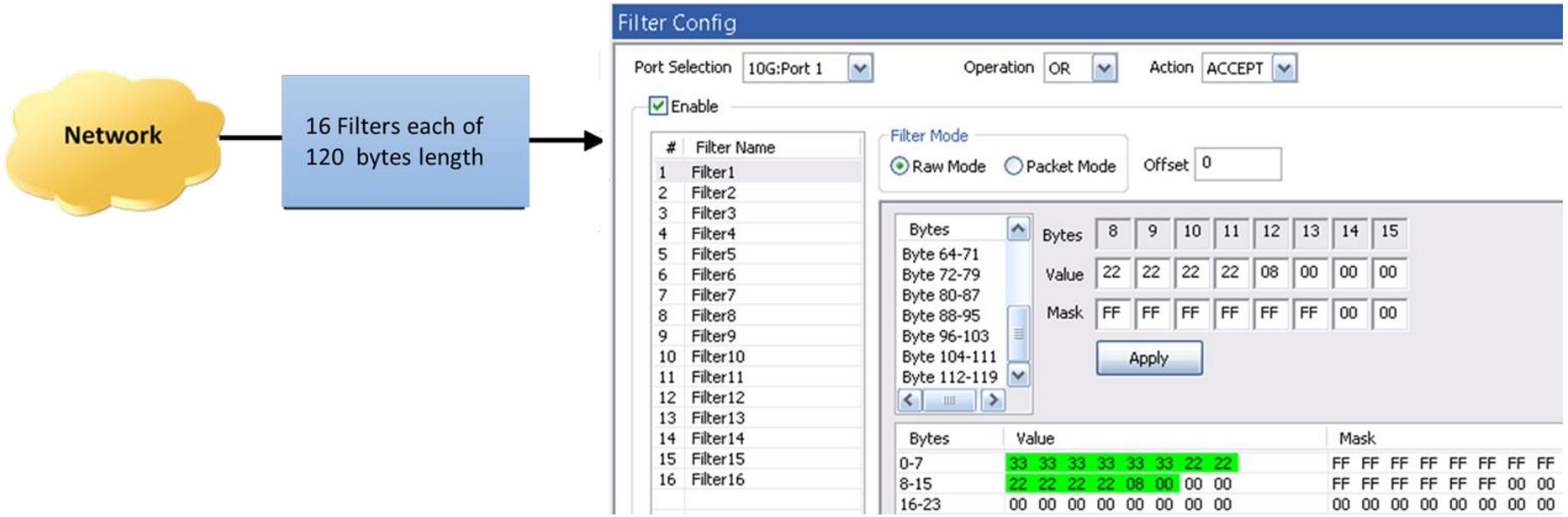
- Record Only mode
- Playback Only mode

GL Communications

Working Principle

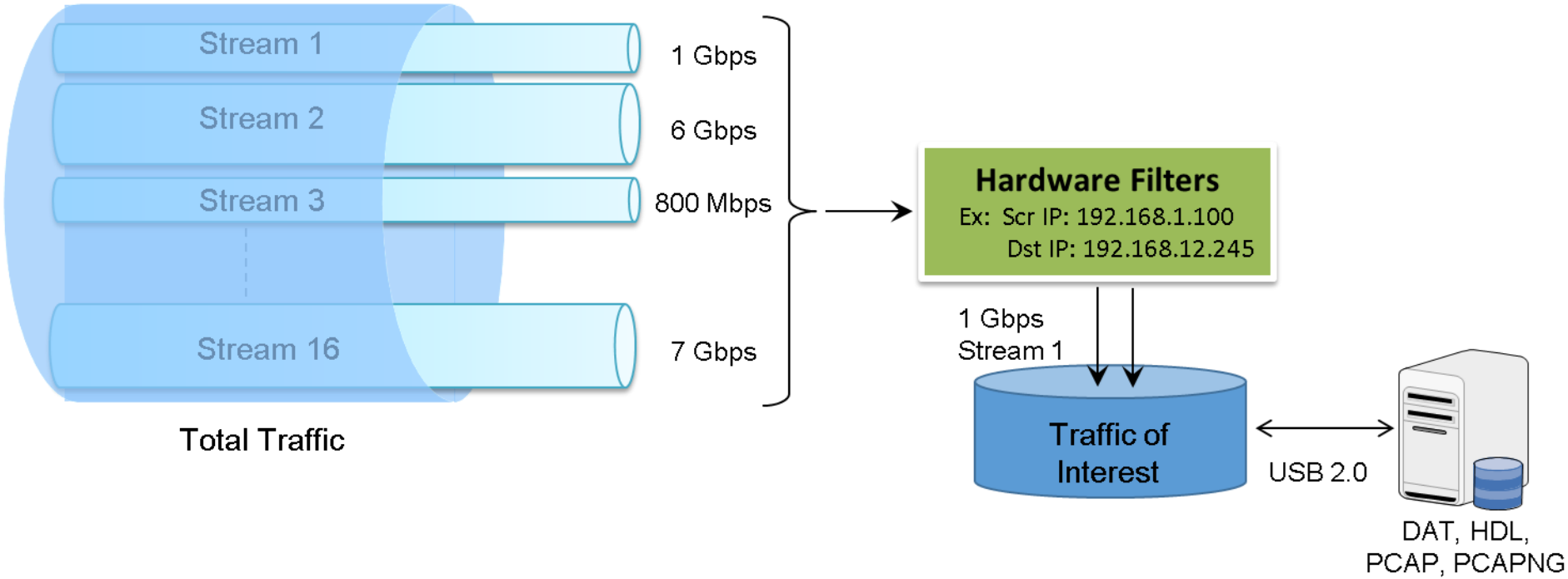


Wirespeed Packet Filters and Triggers



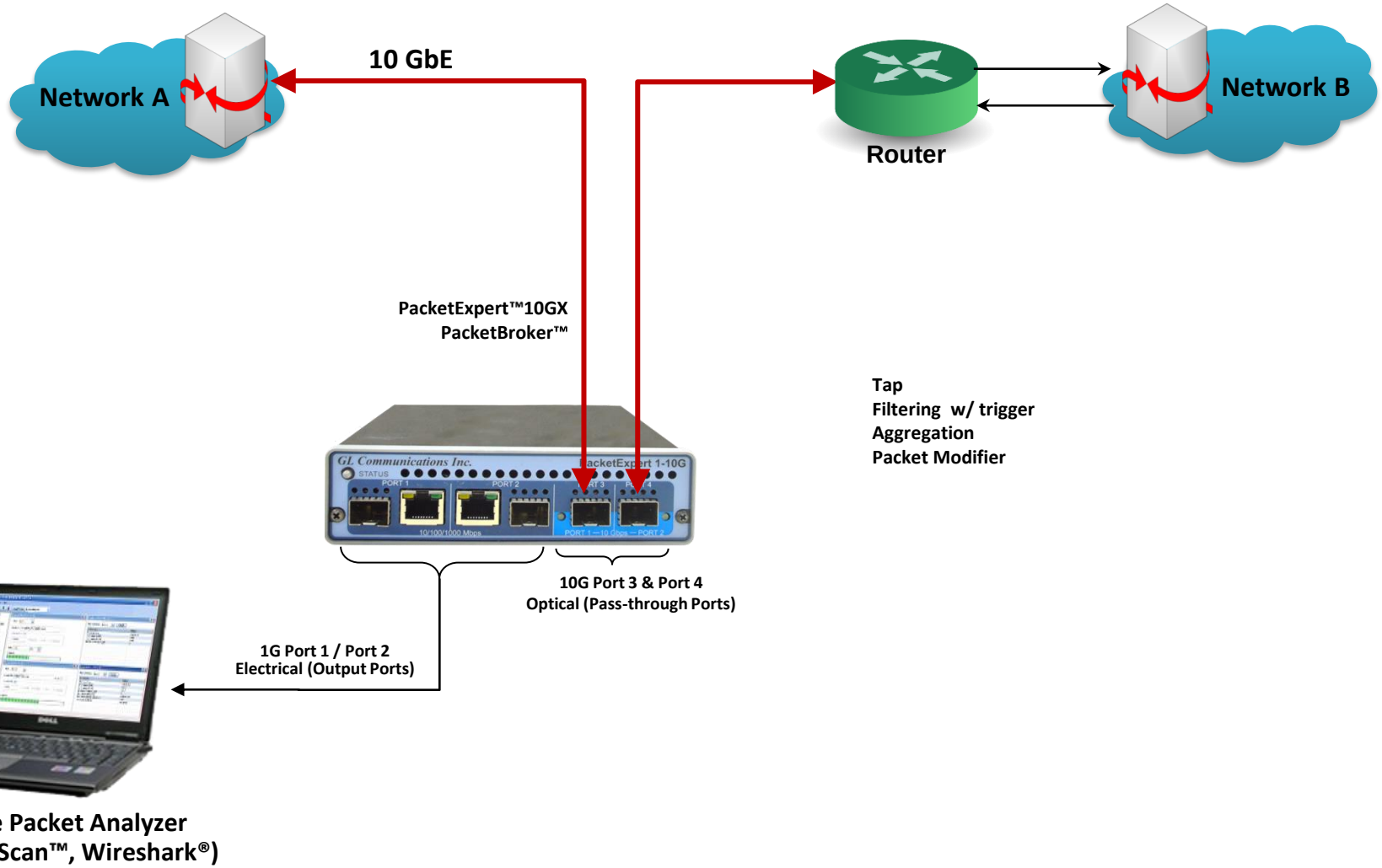
- Filter packets and record only packets of interest
- Capture simultaneously on 2 ports with 120 bytes deep filter per port (for record application) and set filter on any one of the ports or all ports
- Packet filtering can be based on all Layer 2 (Ethernet), Layer 3 (IP) Layer 4 (UDP/TCP) Headers
- Up to 16 filters can be defined per port. Each filter is up to 120 bytes wide
- Filter can be set to each bit in the packet (Raw mode) or each field (Packet Mode)
- Generates a trigger (1 Microsecond pulse) for each packet that passes the filter
- Filter on various header fields like Source/Destination MAC Address, VLAN Id, MPLS Label, Source/Destination Ipv4 Address, Source/Destination UDP ports

Capture Traffic of Interest

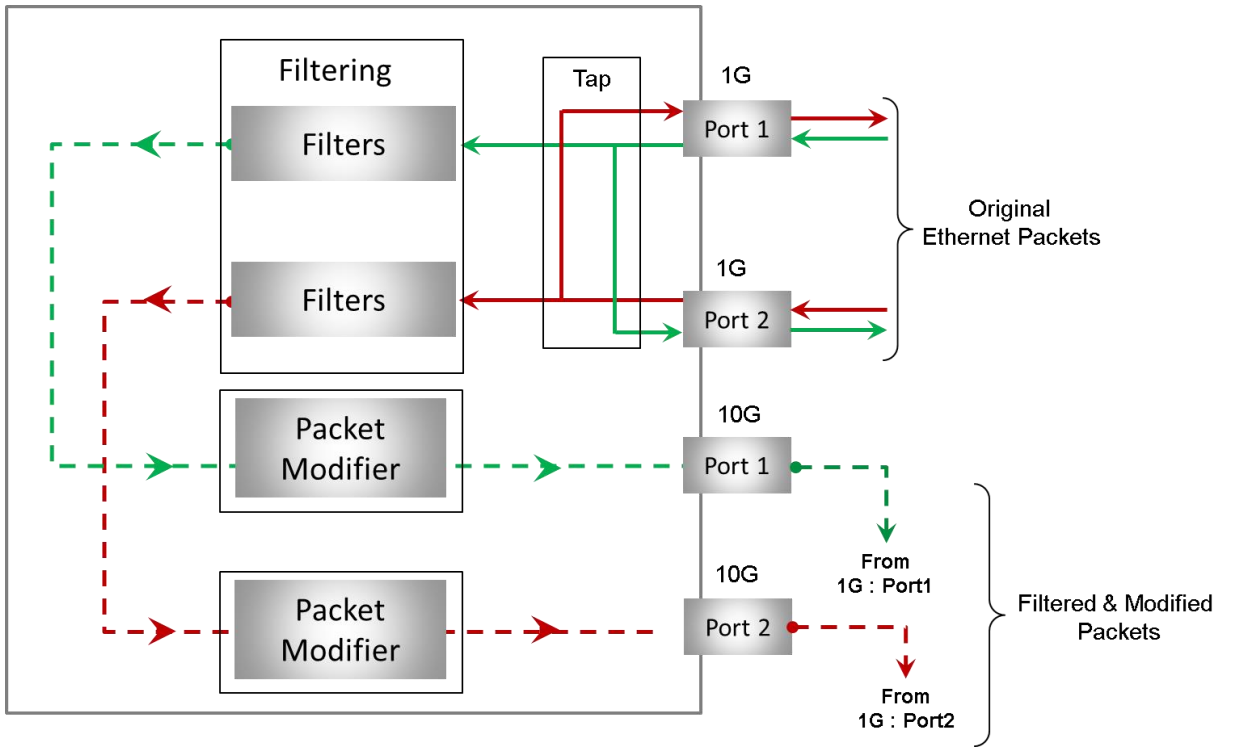


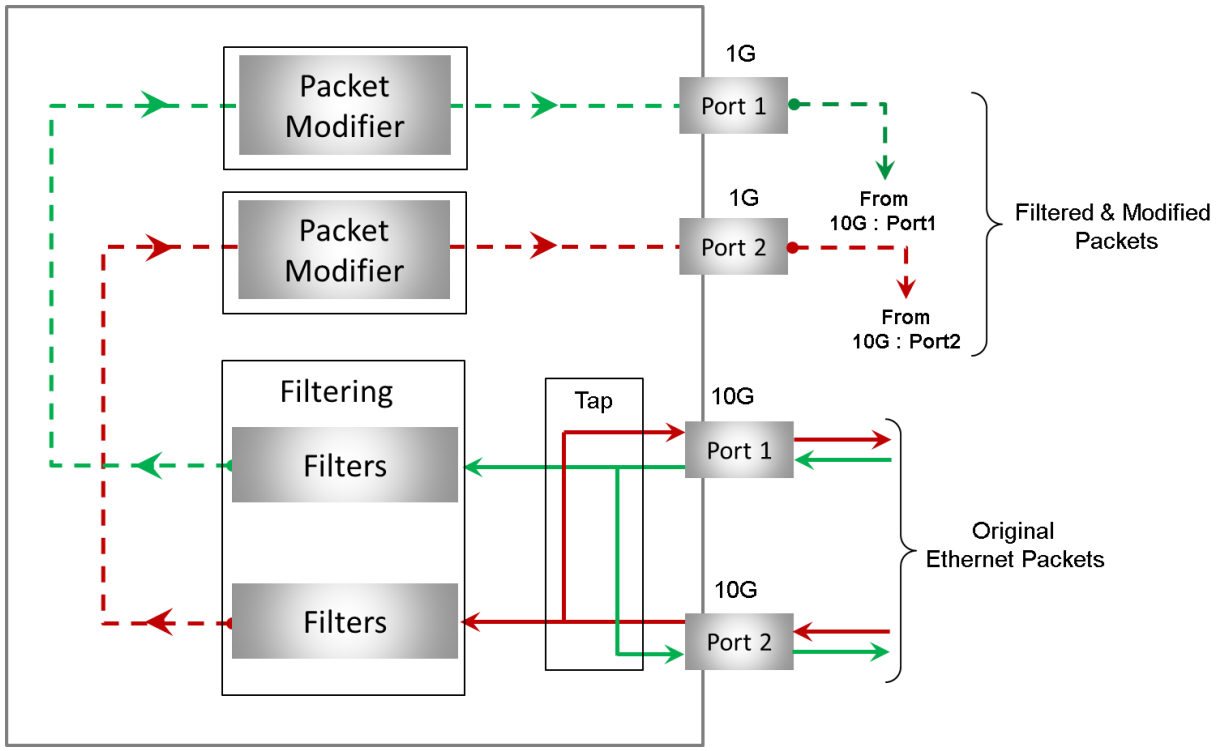
- The network traffic containing n streams of varying data rate is filtered at the PacketExpert™ hardware as per the filter settings. The overall transmit rate is limited to the USB 2.0 transfer rate
- Transmit rate can go up to 350 Mbps depending on the host PC configuration

PacketBroker™ in Network

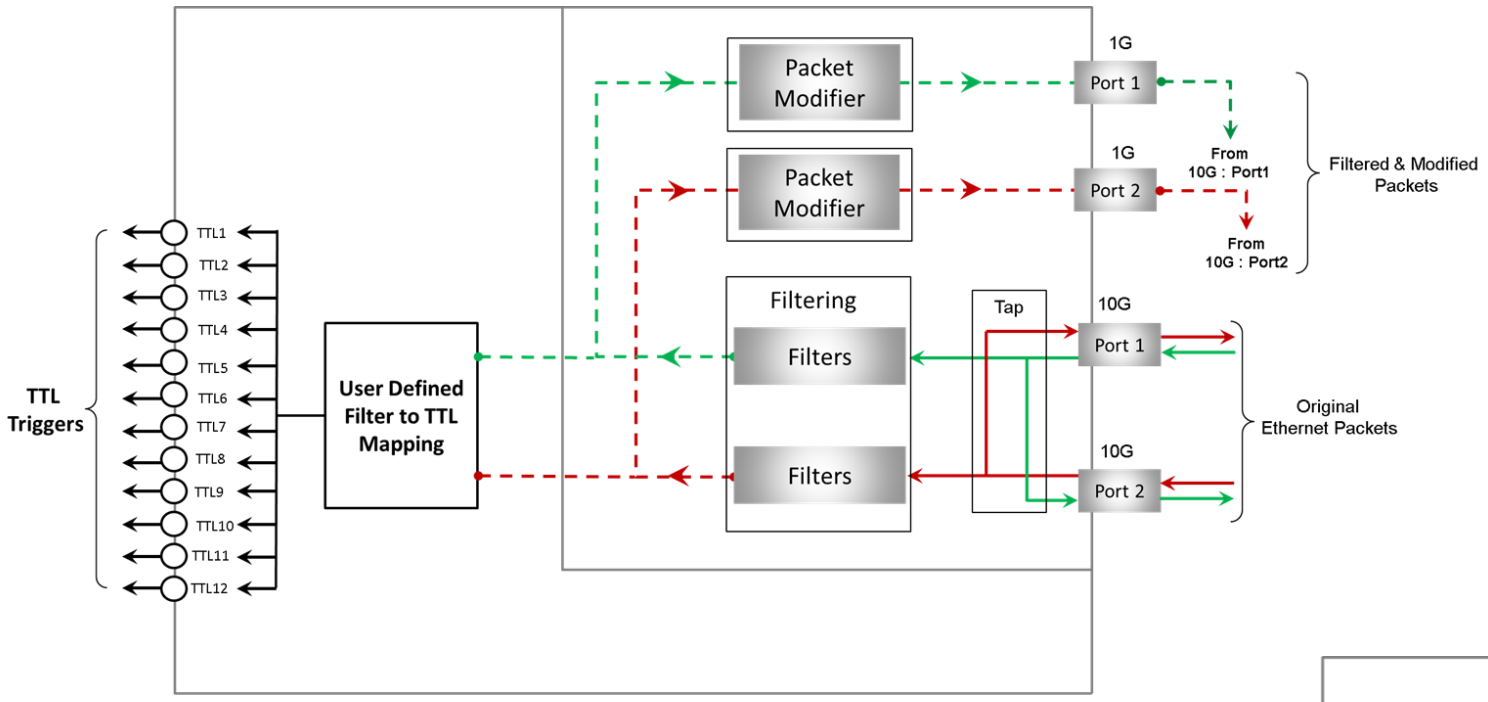


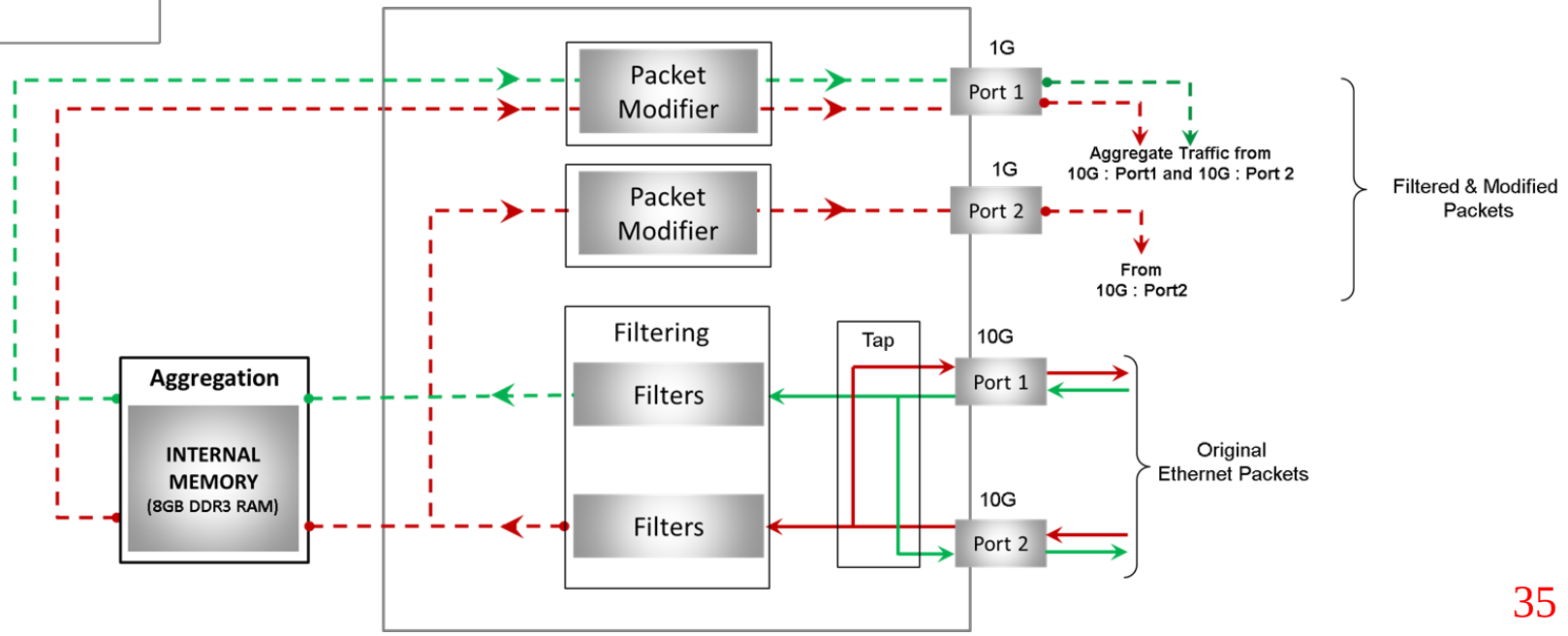
Packet Tap, Filter, Modification, and Output (1G and 10G)





Filtering with TTL Generation and Aggregation

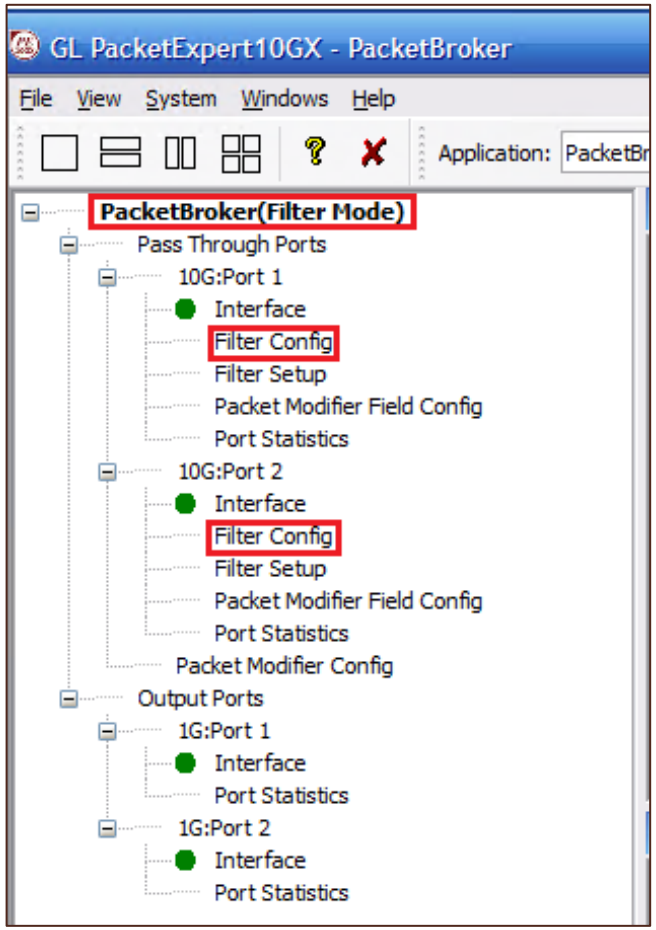




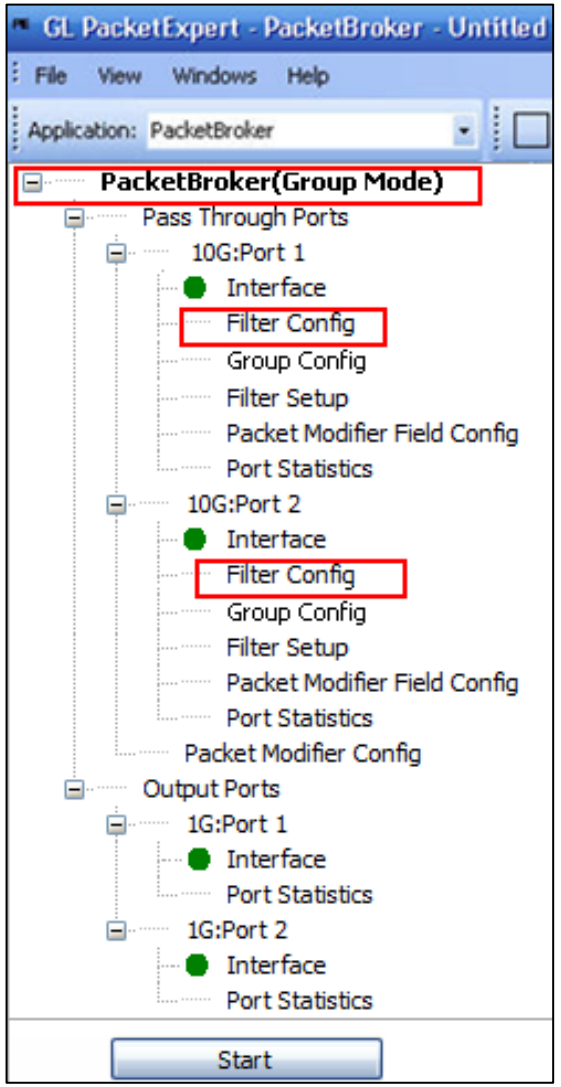
GL Communications

Filter Configuration Menu

Basic Mode Filtering



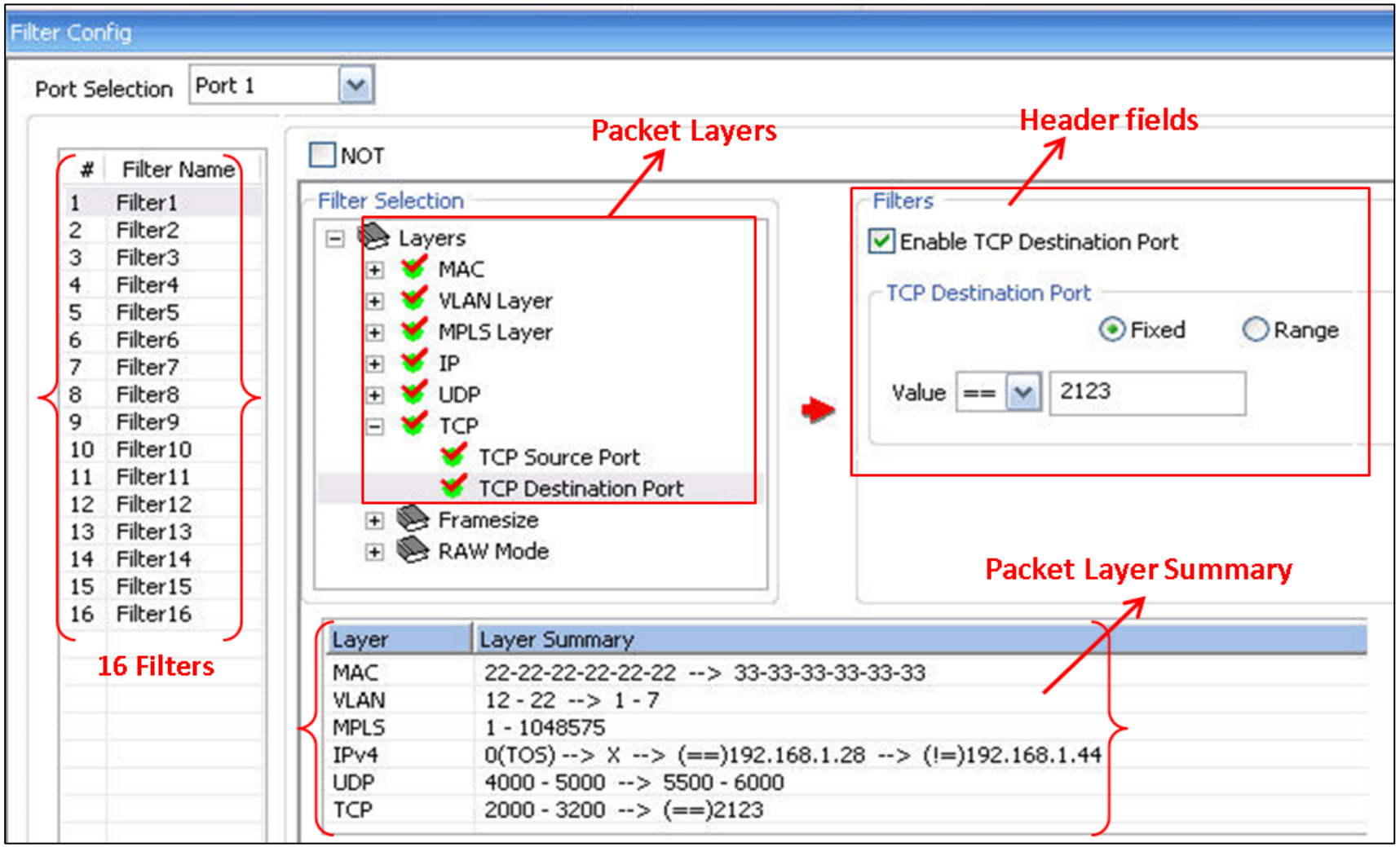
Group Mode Filtering



GL Communications

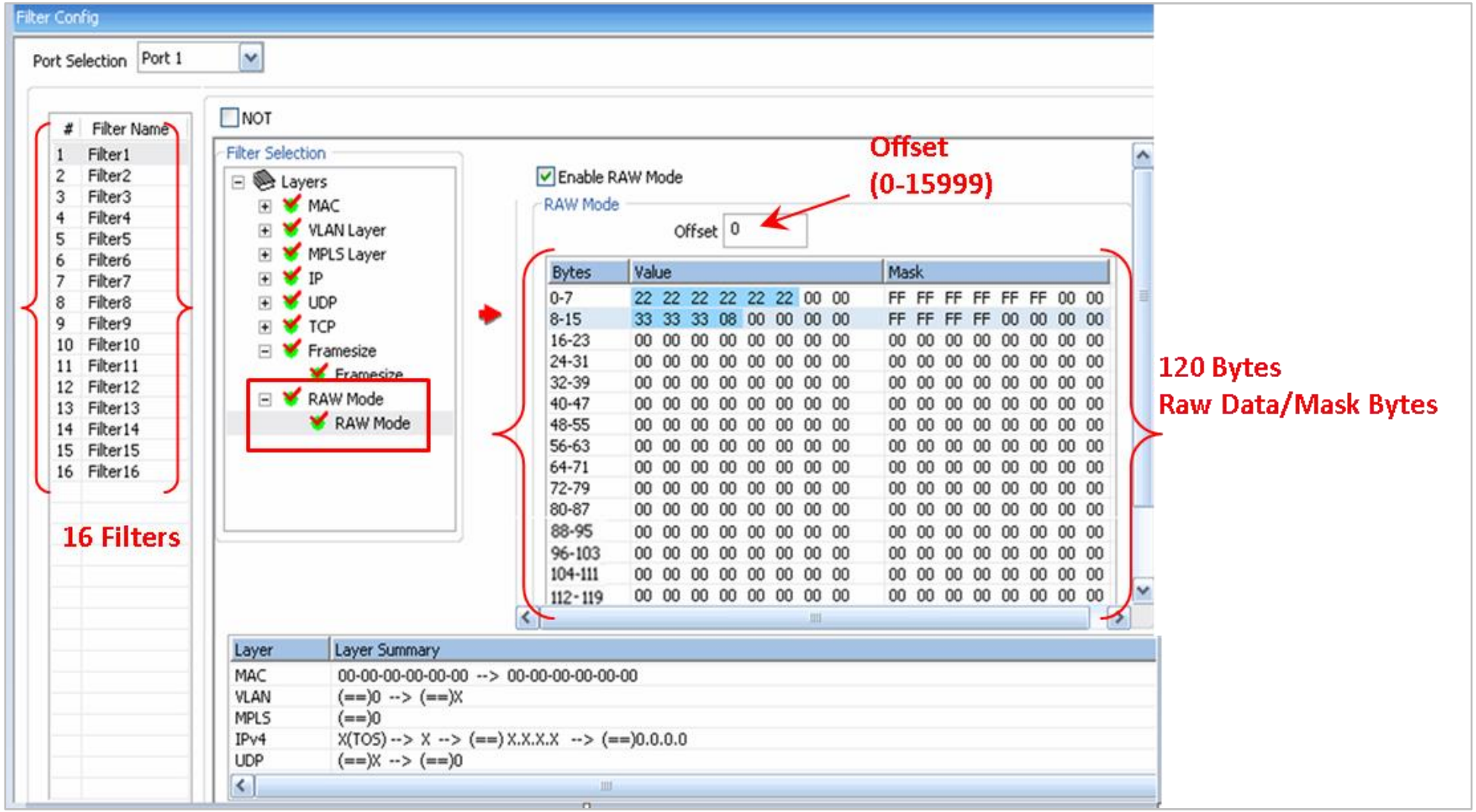
Filter Configuration

Packet Mode Filtering



Filter Configuration

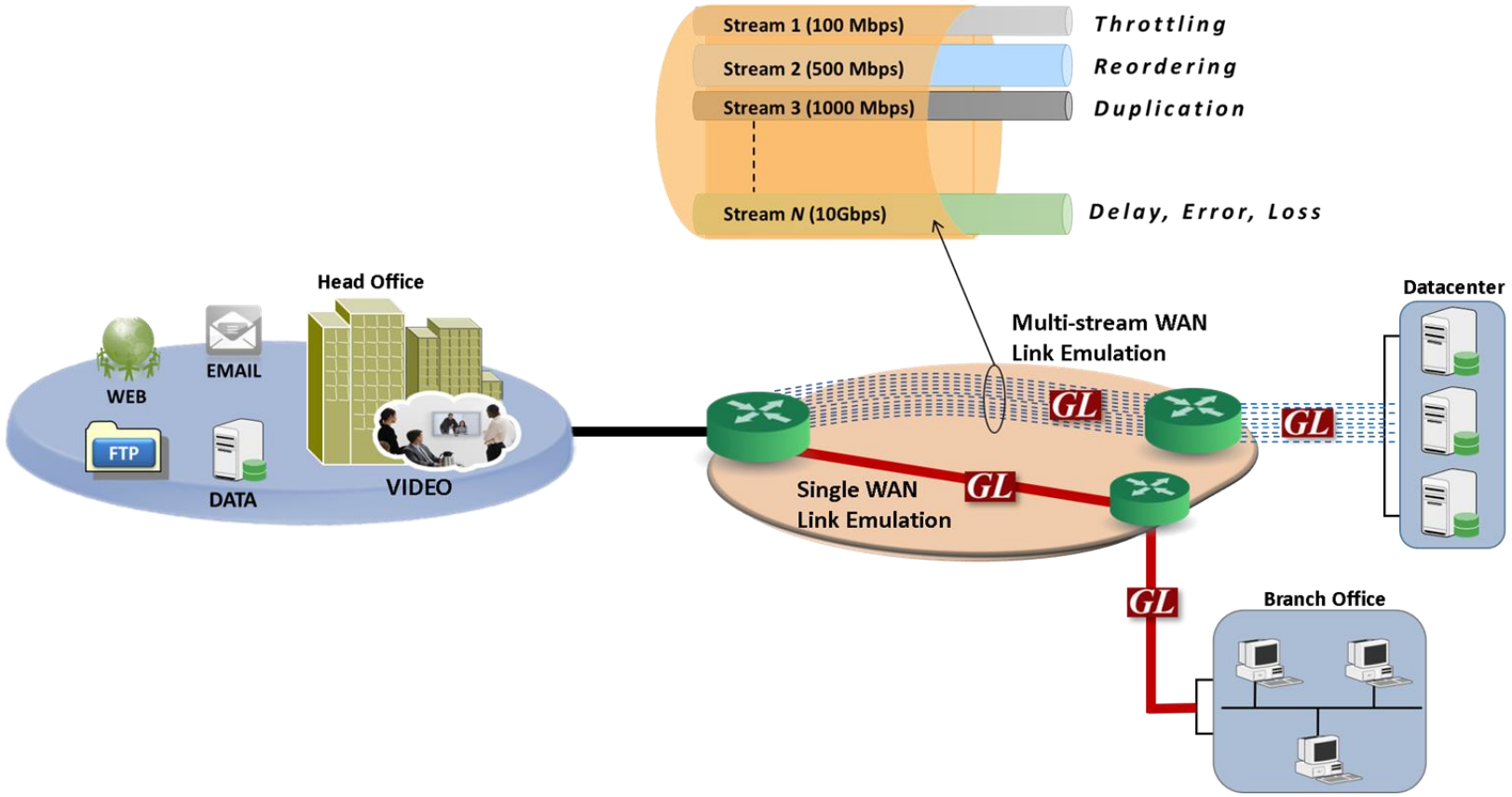
Raw Mode Filtering



Overview

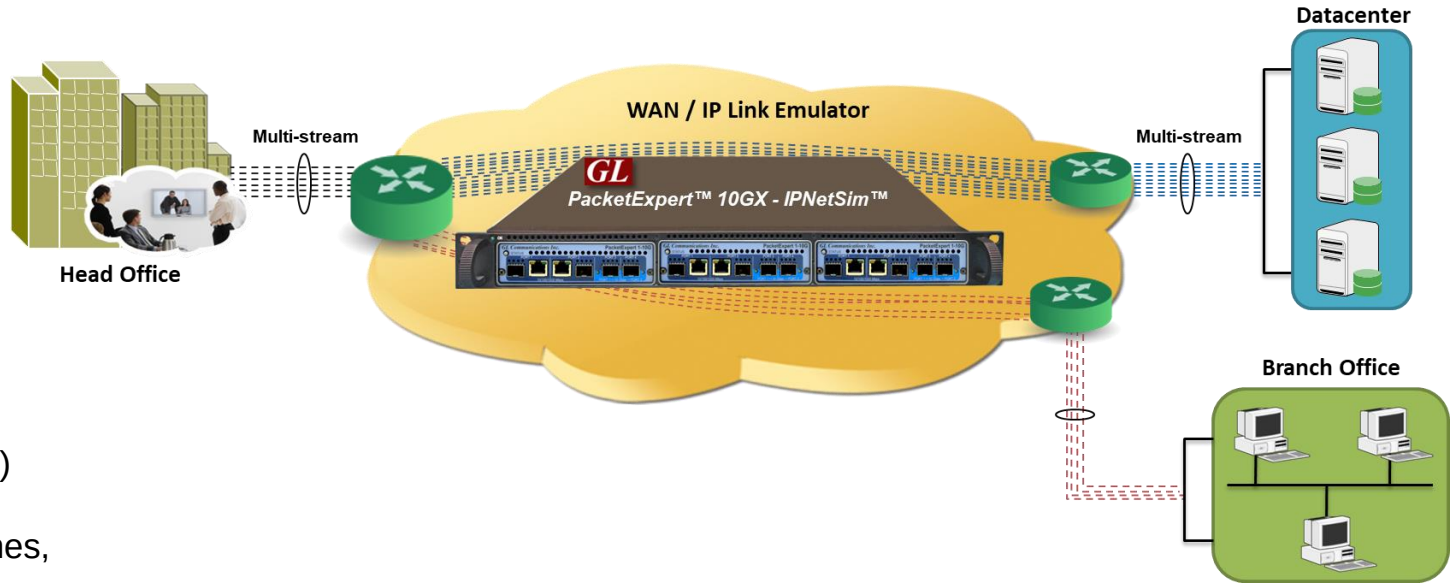
How does GL simulate real-world IP Networks? What is GL's IPNetSim™?

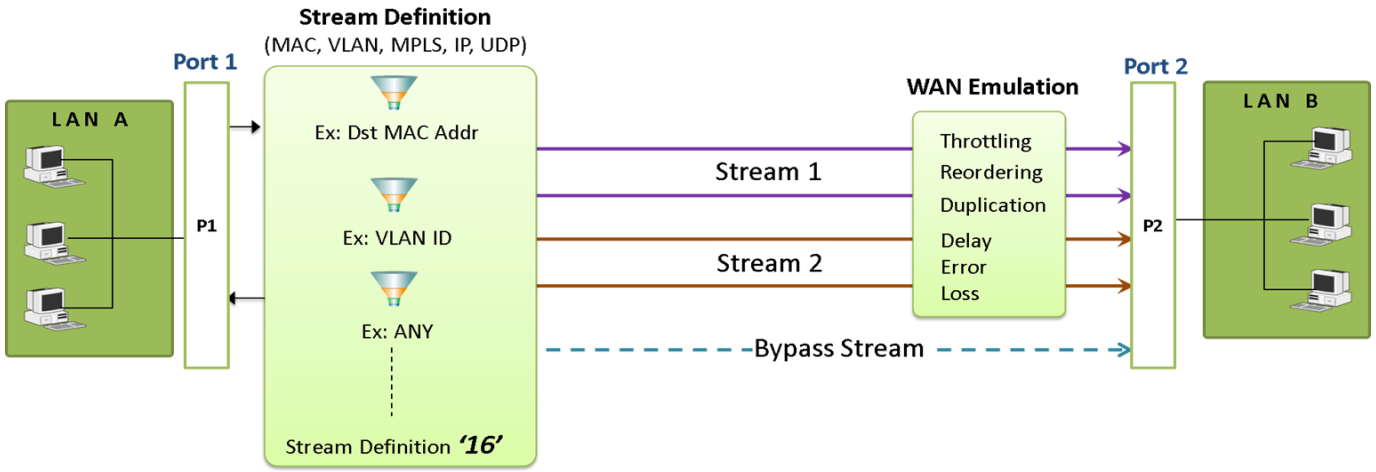
- Lab Testing Solution - application and automation
- Emulate Full Duplex 1 Gbps and 10 Gbps networks
- Real-world network conditions by imposing impairments
- Multiple streams independently configured

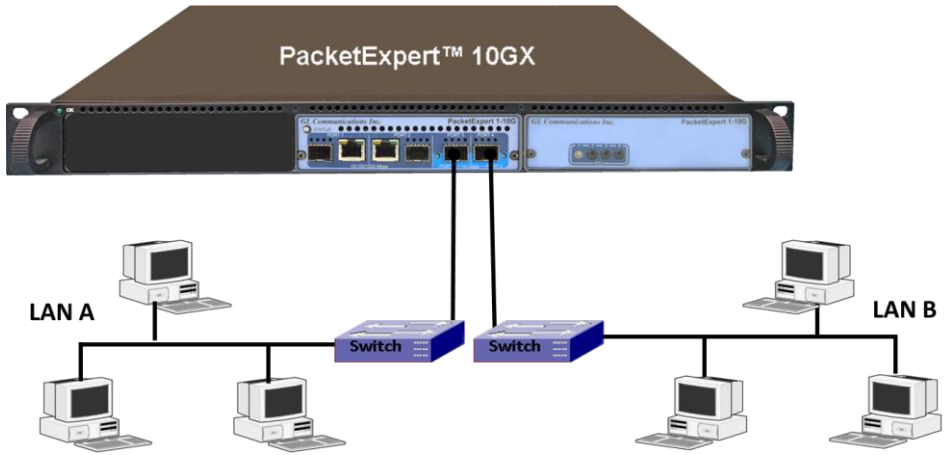


Application and Stream Overview

- Test Enterprise and Individual-level applications
  - Audio and video streaming (VoIP, IMS, HDT, IPTV)
  - Storage services (Critical Data Access)
  - Cloud and web services
  - FTP / HTTP
- Simulate backhaul network
  - Static and dynamic networks
  - Satellite + other long delay networks
- Test Quality of Service (QoS) and Quality of Experience (QoE)
- Evaluate the stability of network devices (switches, VoIP Phones, VoIP PBXs, Set-top boxes and VoD Servers

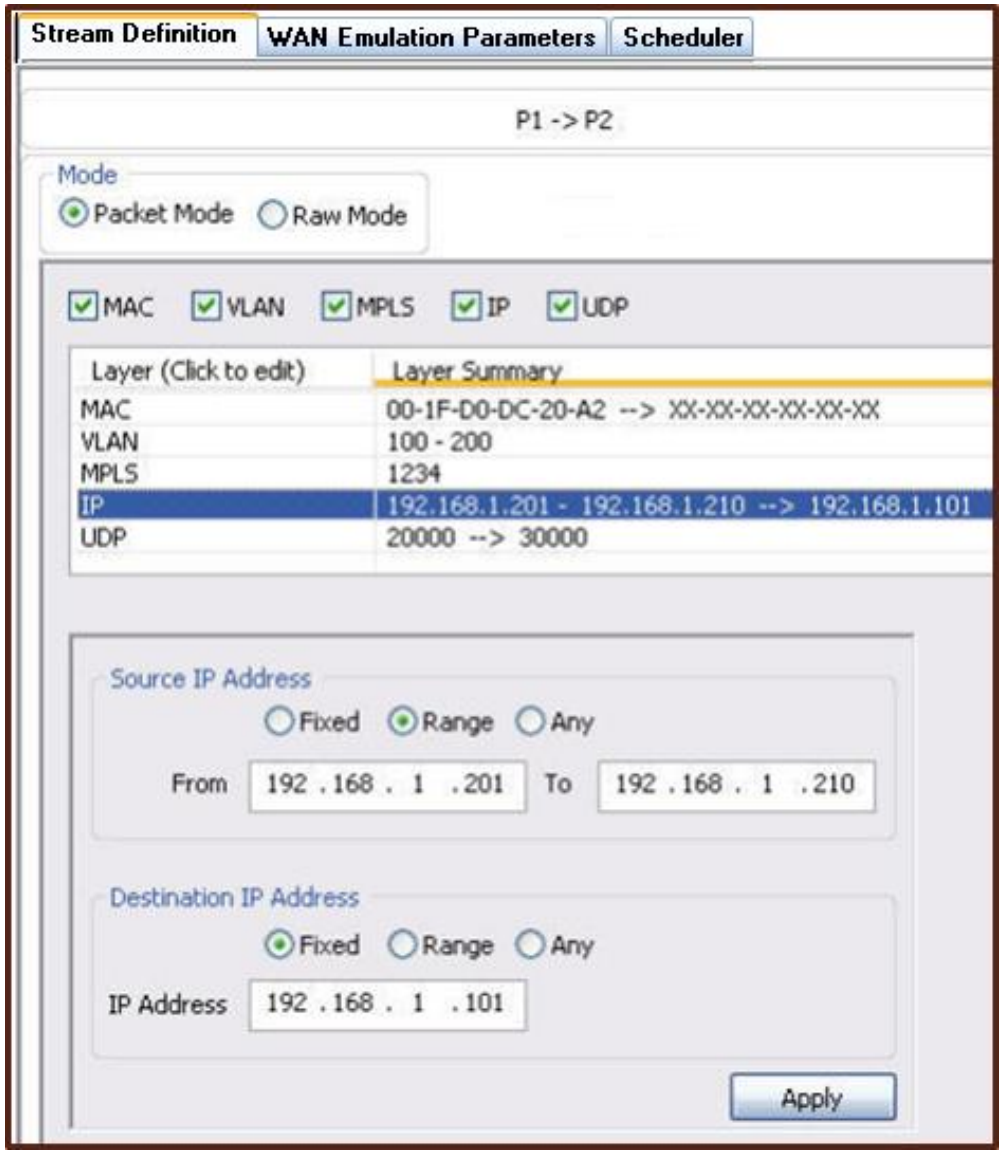


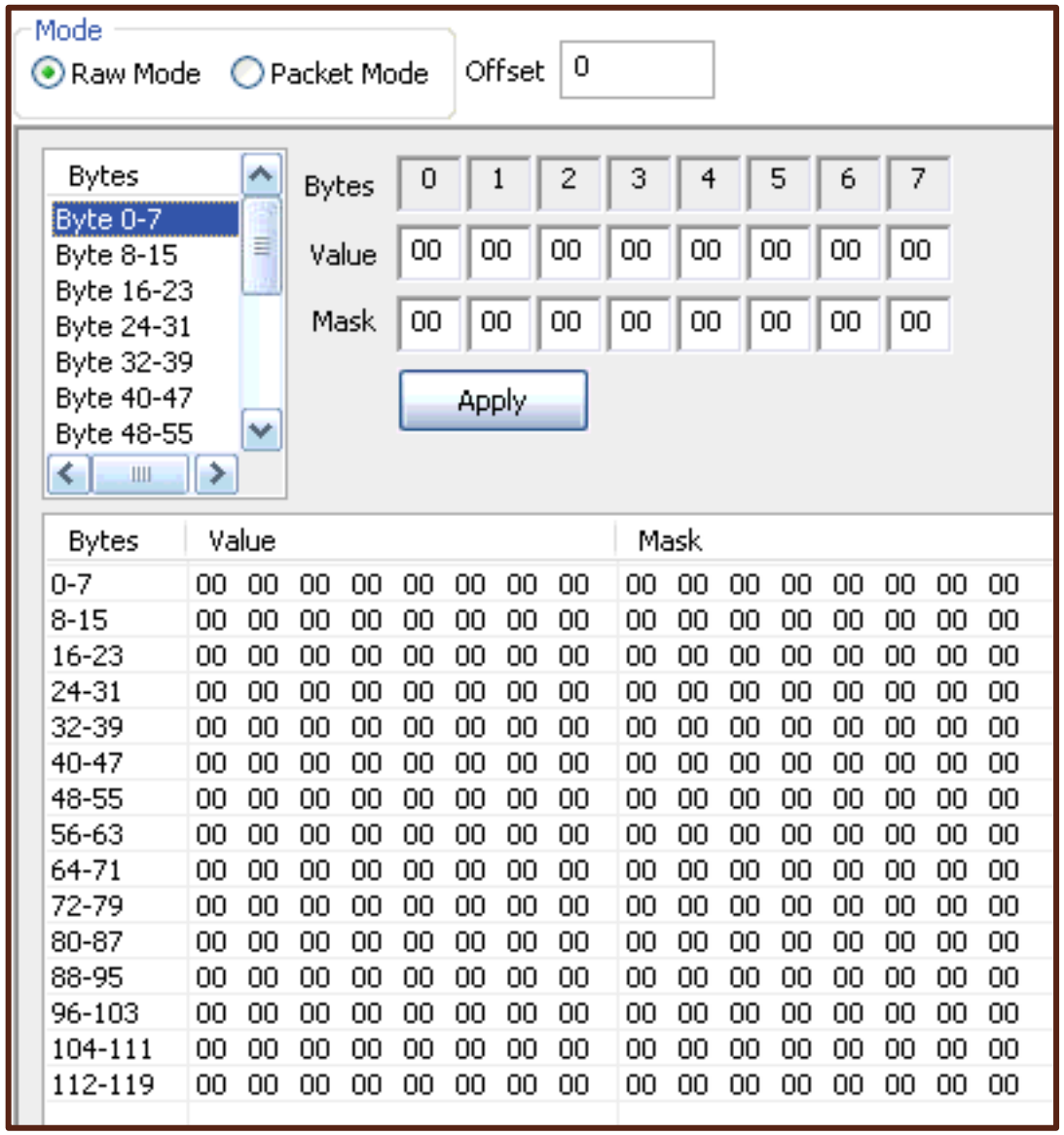




GL Communications

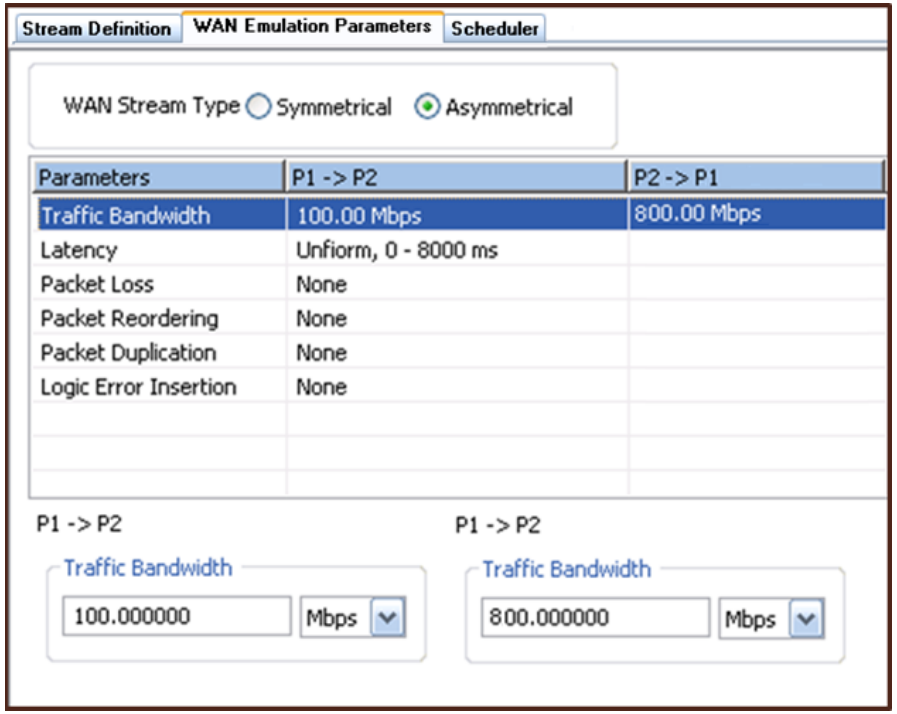
Define Streams in Packet Mode and Raw Mode

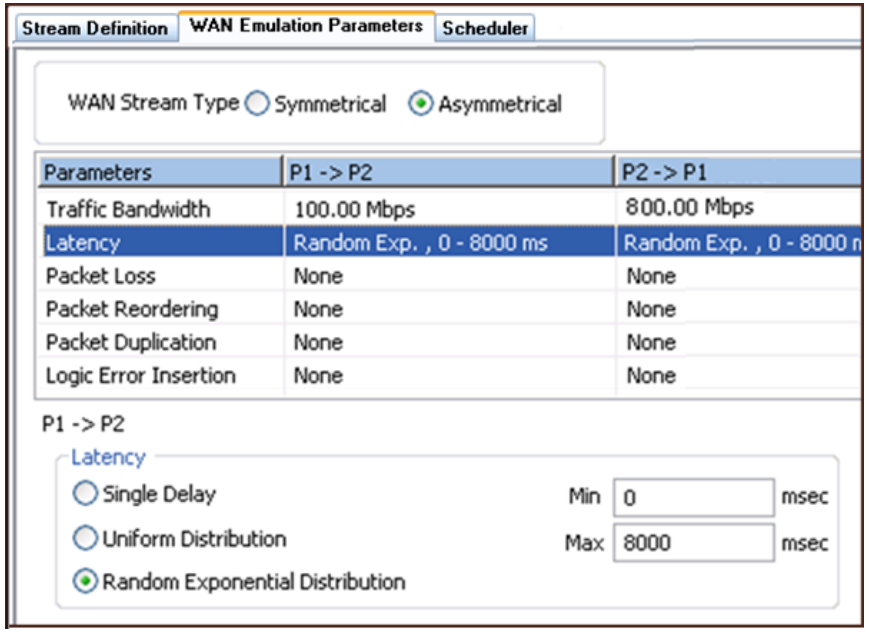


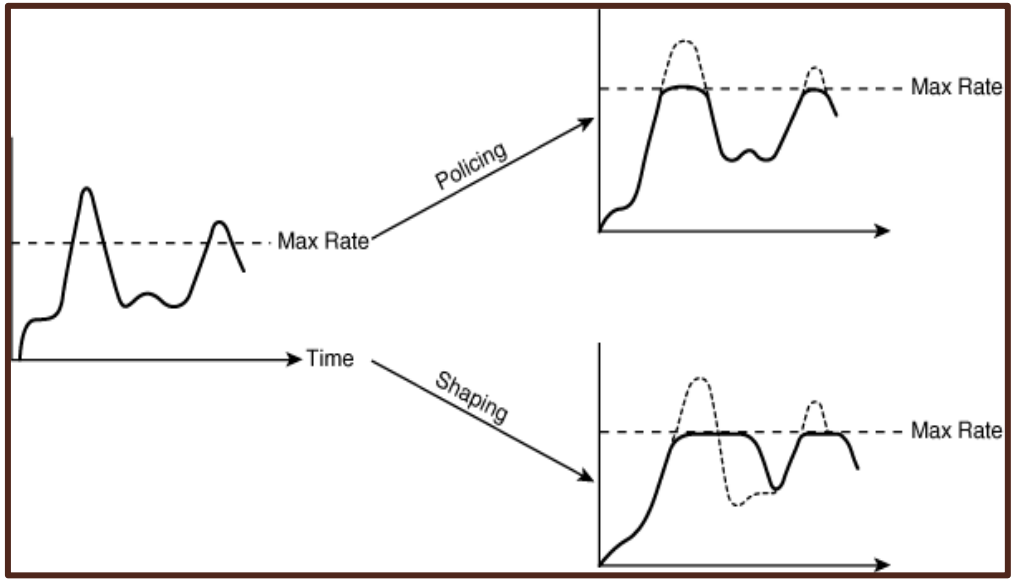


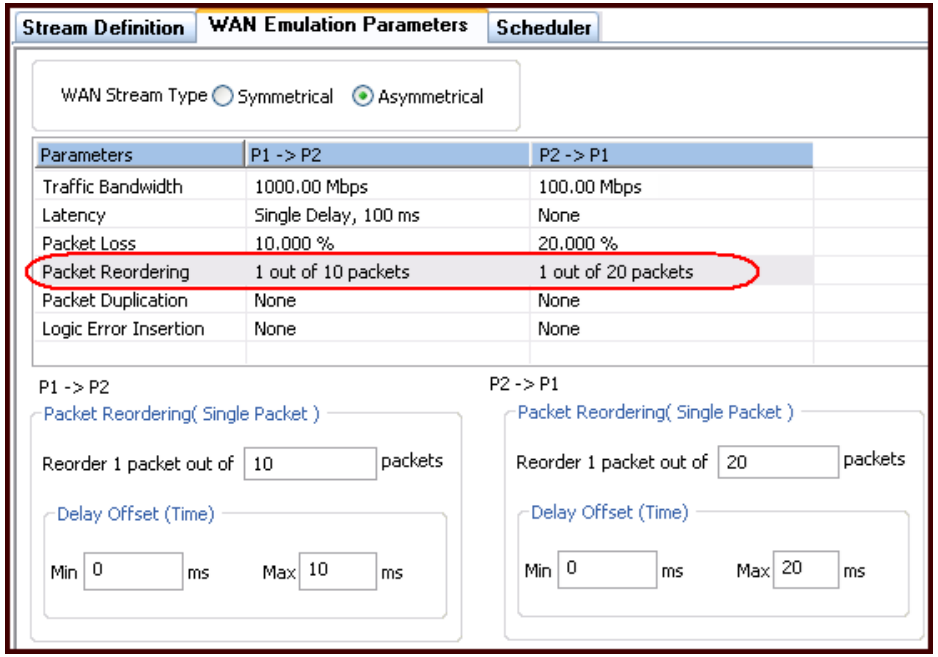
GL Communications

Impairments and Configurations



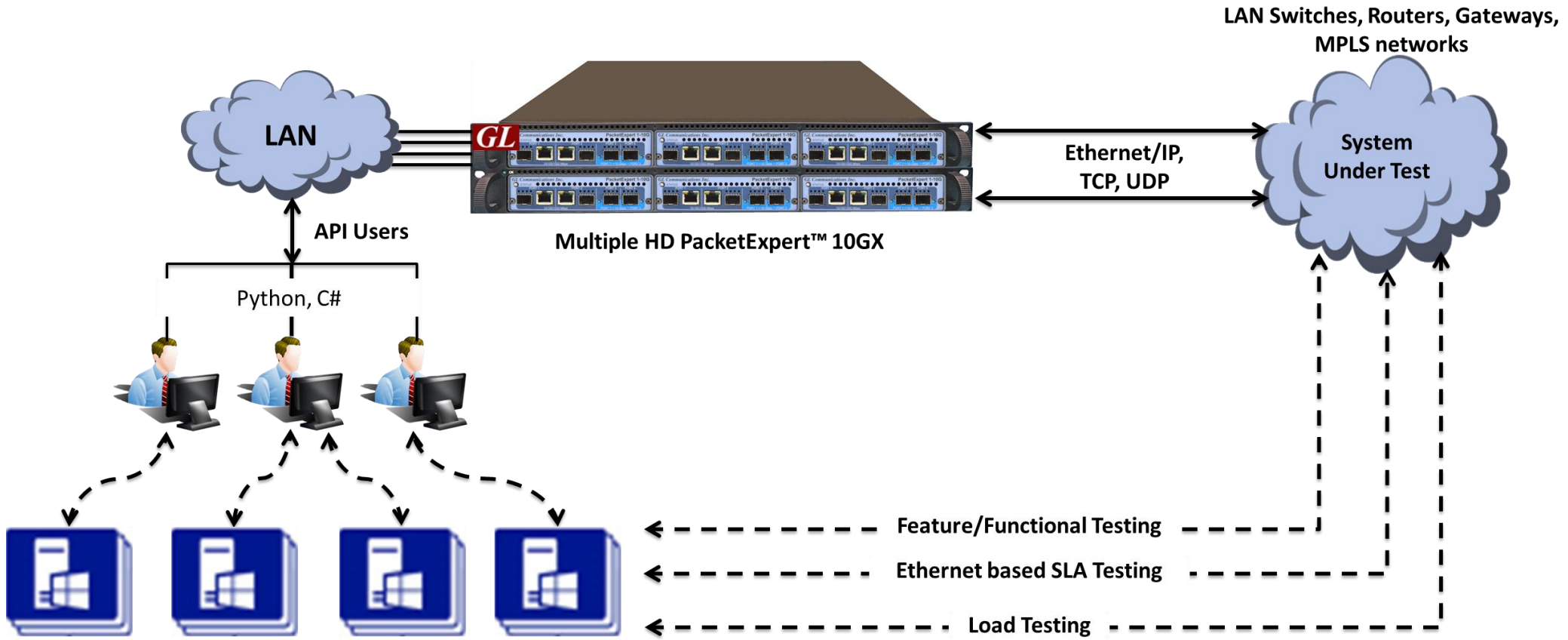






GL Communications

MAPS™ CLI Client/Server Architecture



- PacketExpert™ 10GX also 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, C# client APIs and MAPS™ CLI Client/Server architecture

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Thank you!

For more information contact us at info@gl.com

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