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

GL Communications Inc.
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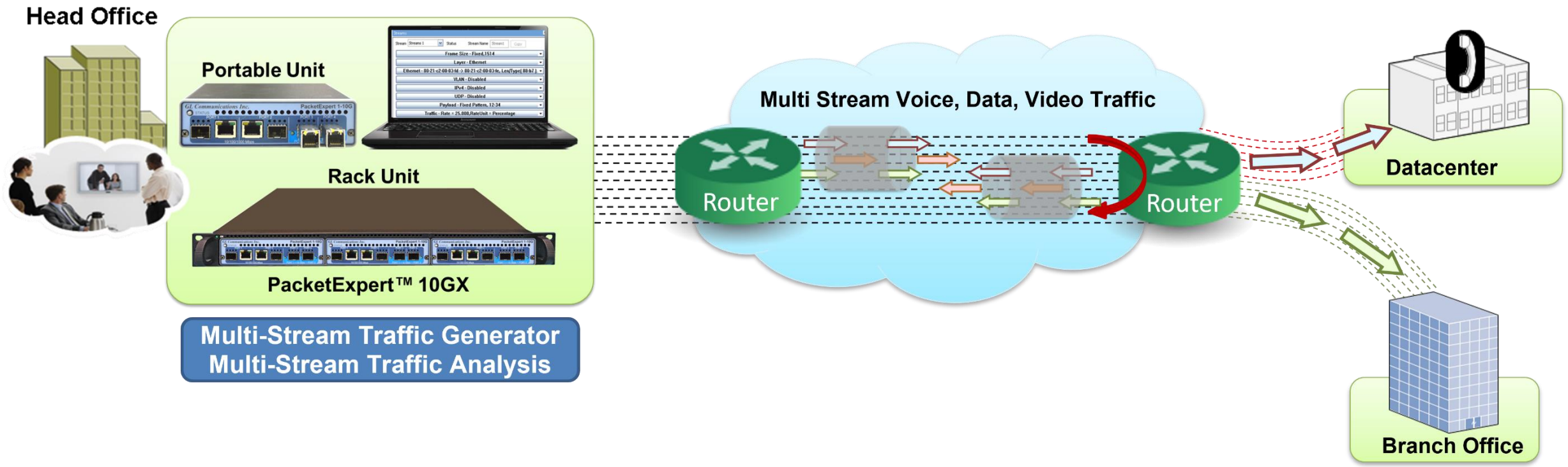
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: https://www.gl.com

Multi-Stream Traffic Generator



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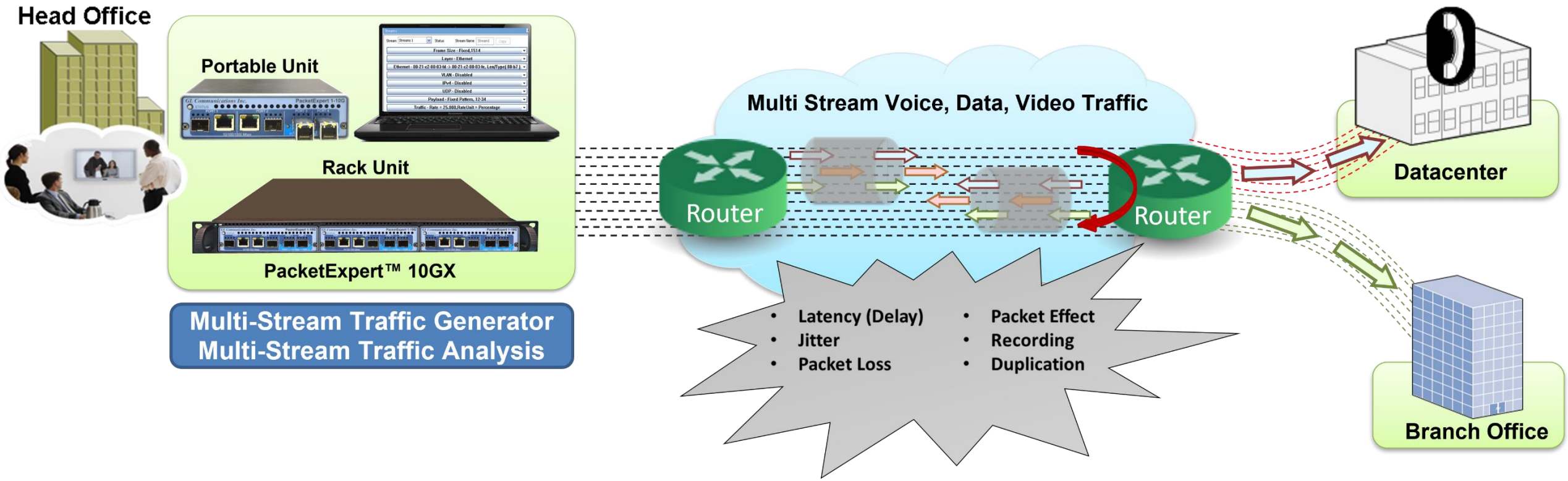
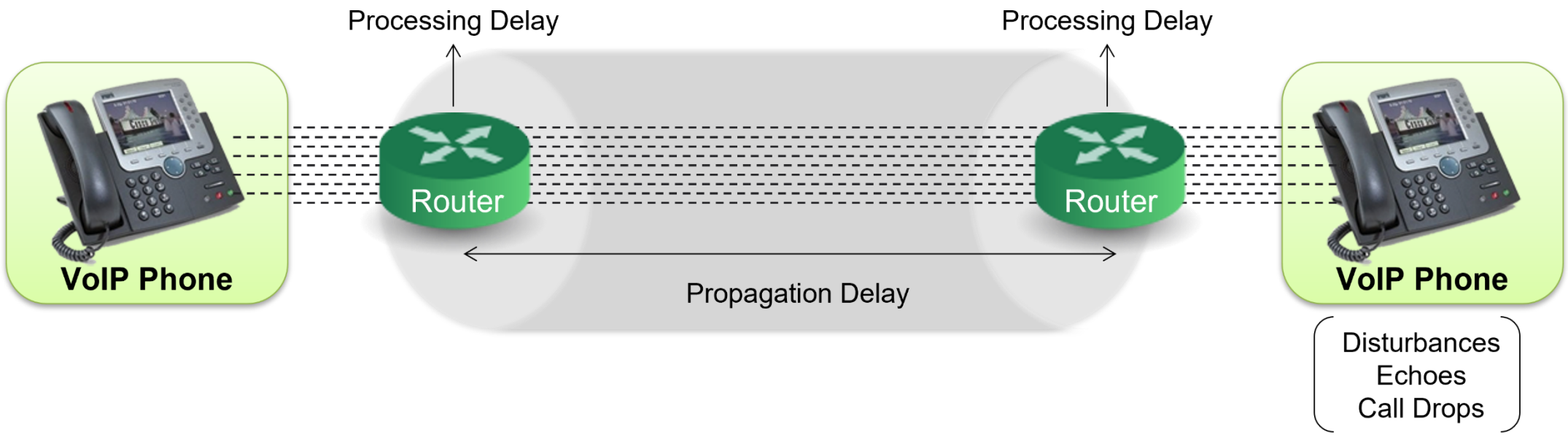
Impairments Introduced by Packet Switching Networks



Latency or Frame Transfer Delay



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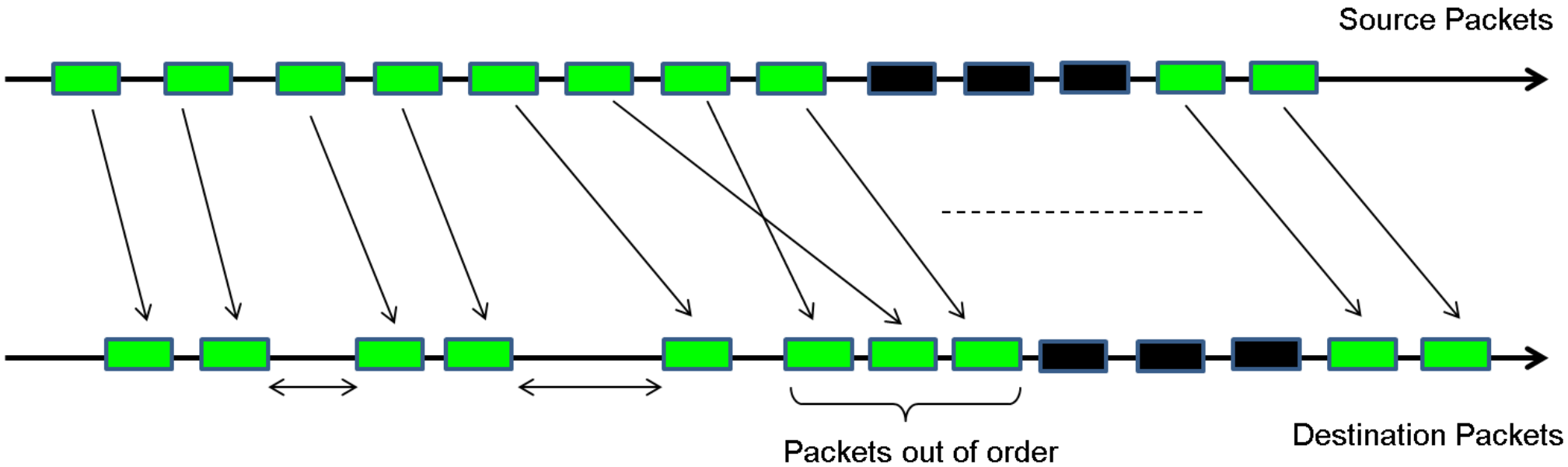
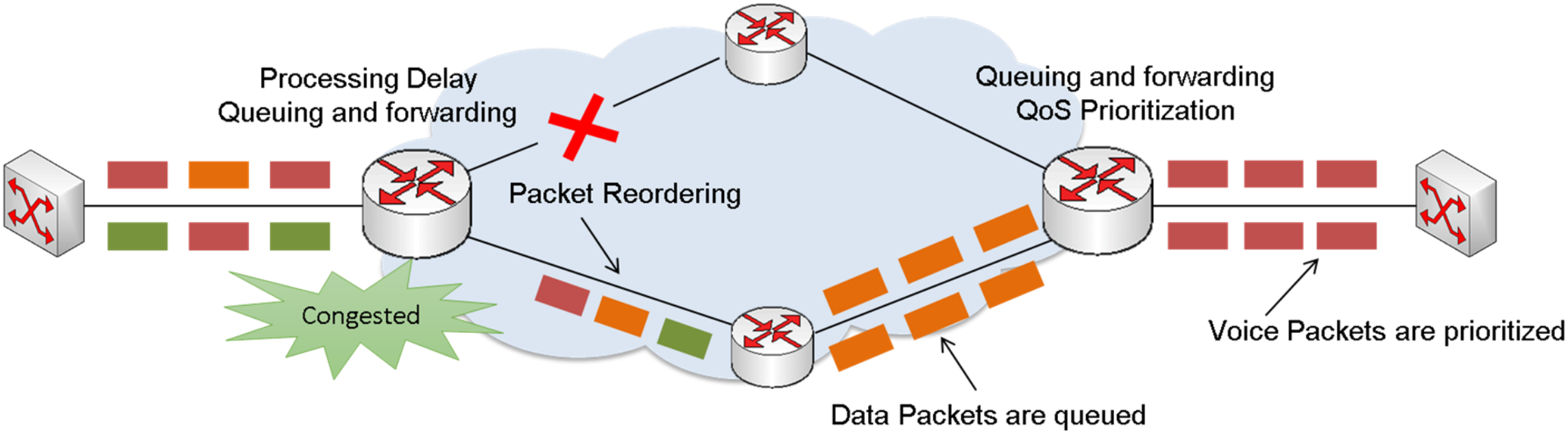
Jitter



Jitter Introduced in Various Ways



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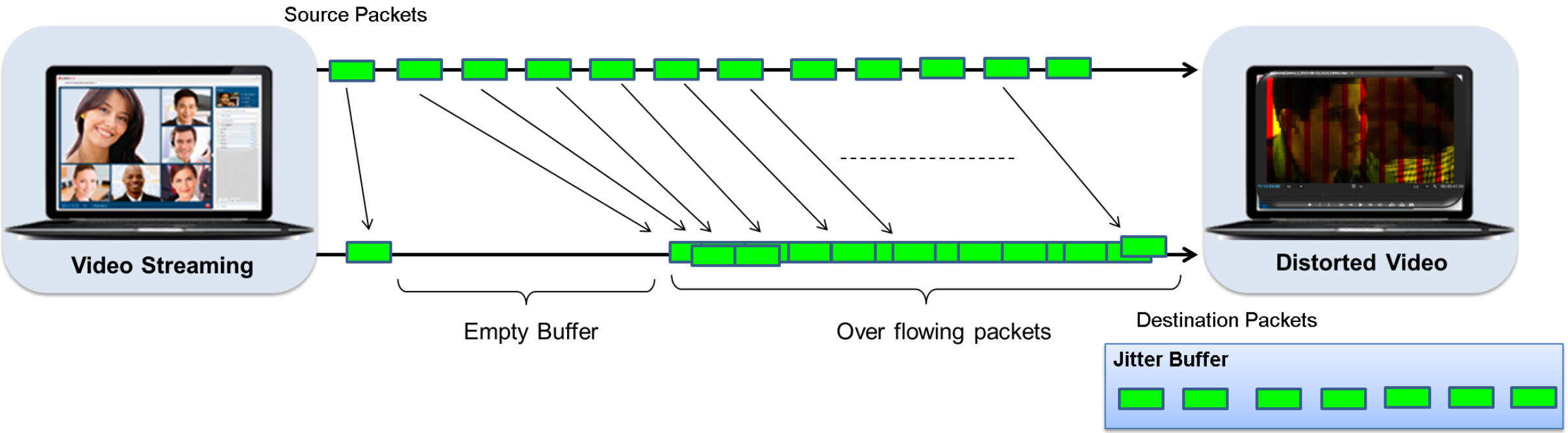
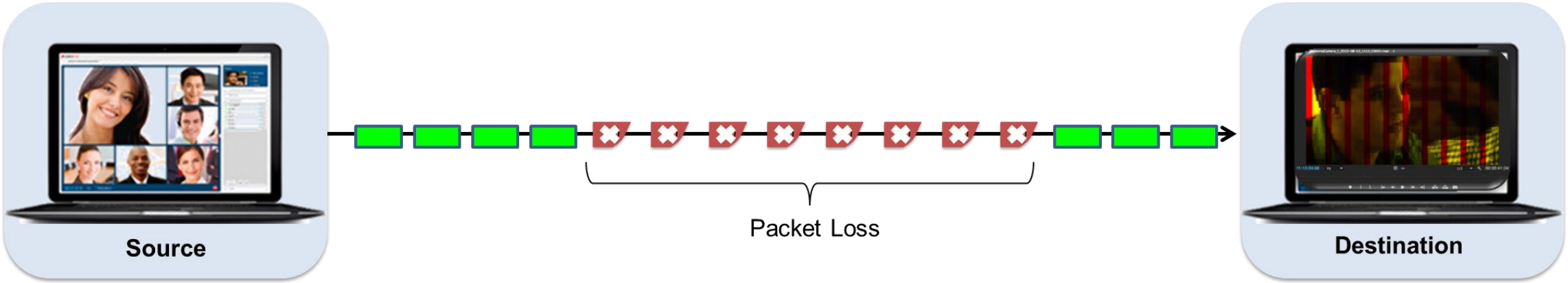
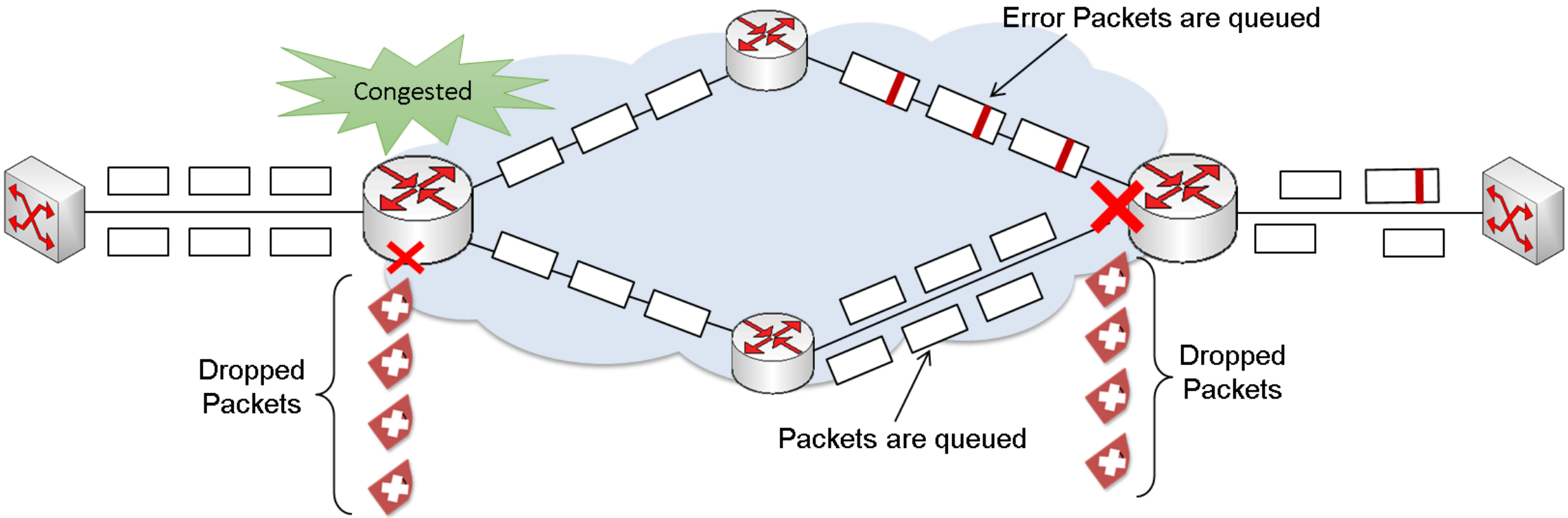
Effects of Jitter on Video Playback



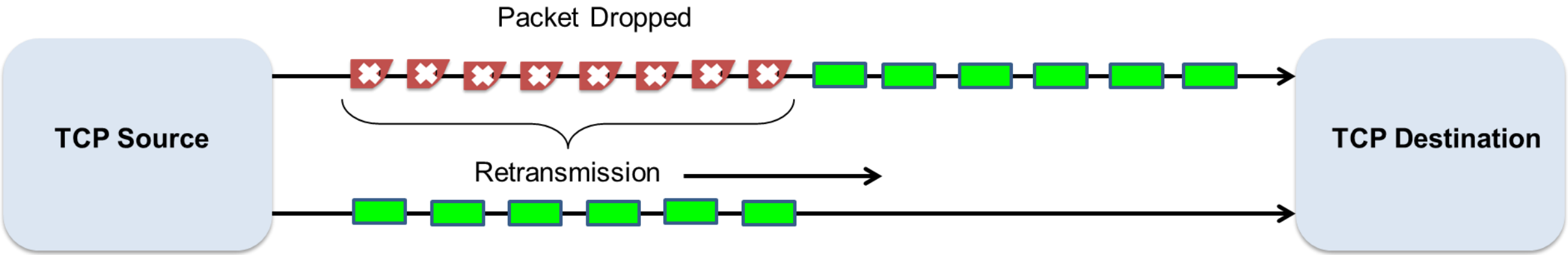
Packet Loss



Packet Loss introduced in many ways



Effects of Packet Loss

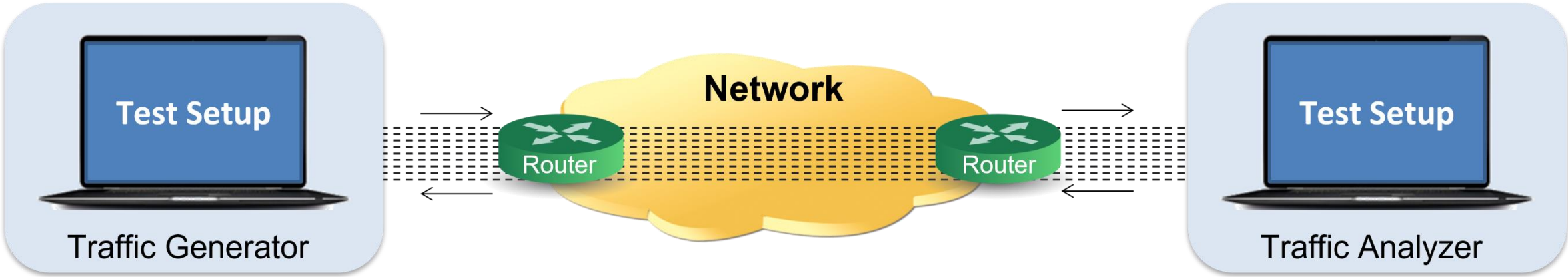


IP Measurements

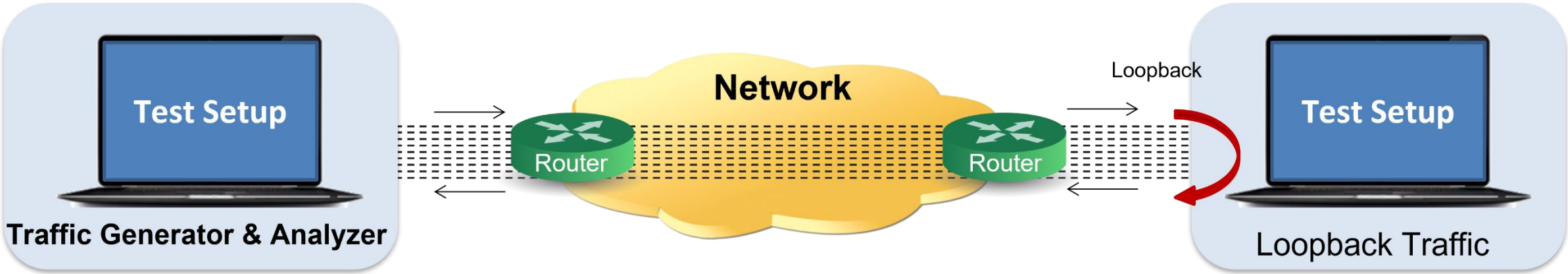
The following are the IP Metrics to measure:

- Throughput/Bandwidth
- Latency/Frame Transfer Delay (FTD)
- Jitter/Frame Delay Variation (FDV)
- Packet Loss/Frame Loss (FL)

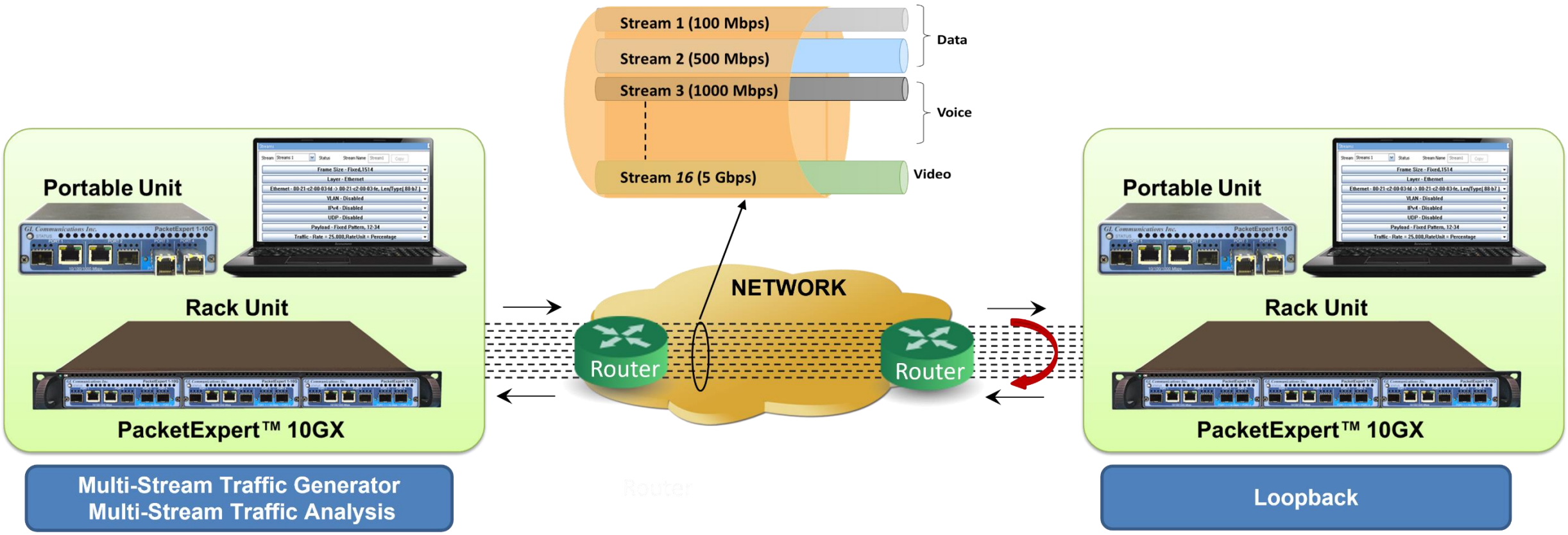
End-to-End Test Setup



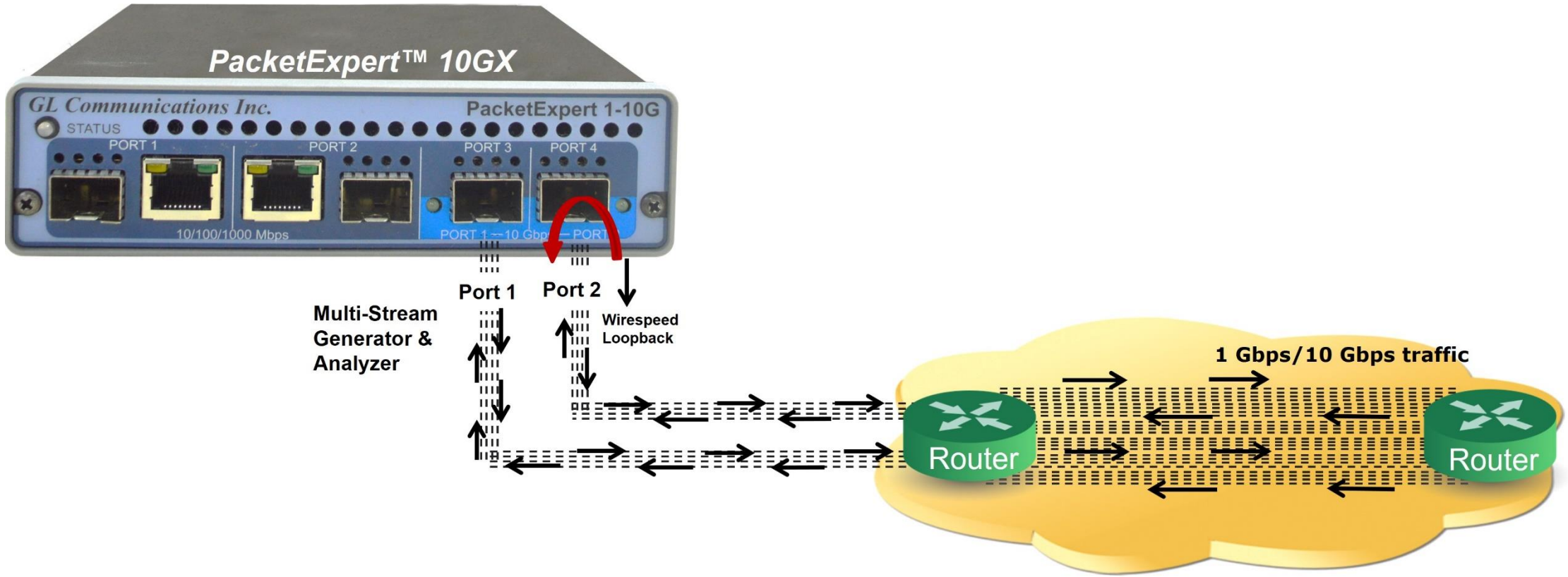
Test Setup Remote Loopback



Multi-Stream Generator and Analyzer

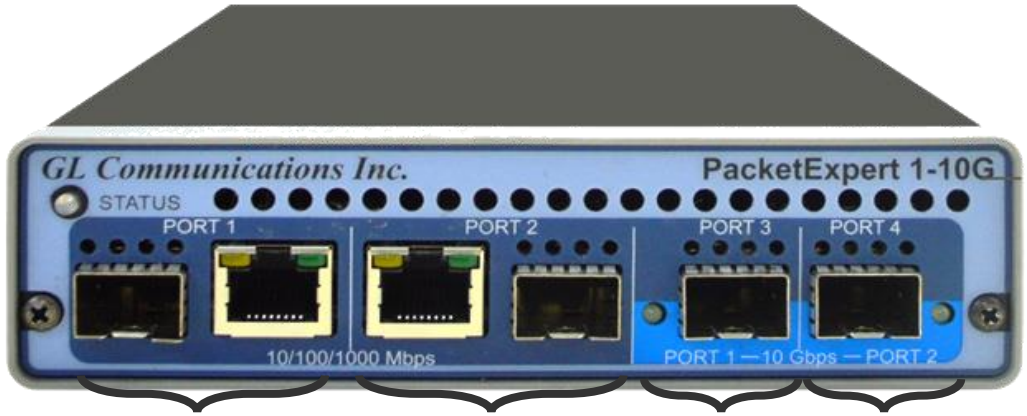


Local Loopback for Convenience



Hardware

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

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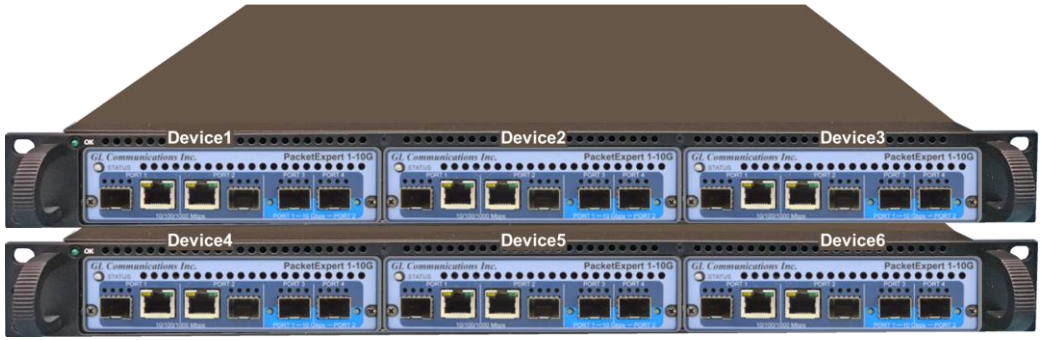
MTOP™ Rack Units

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, ATX Power Supply • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports

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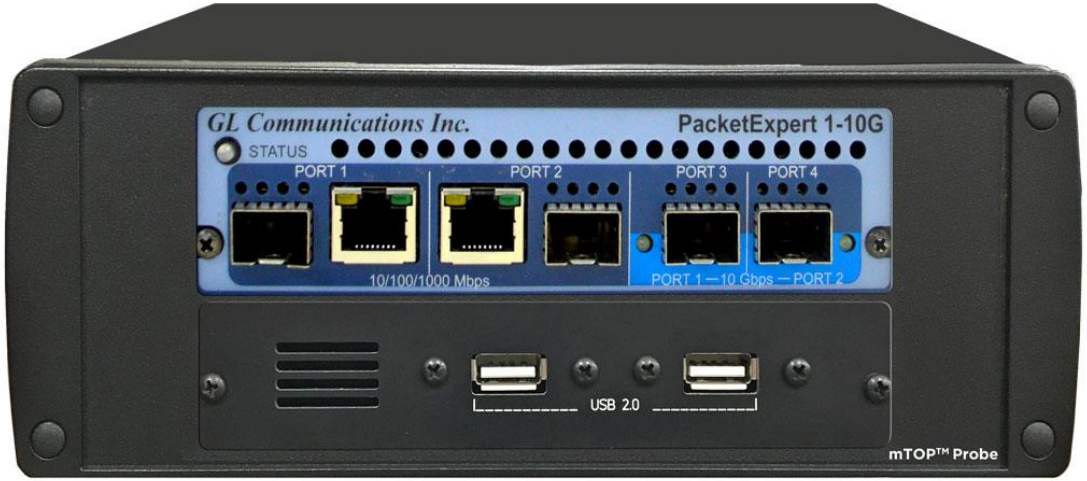
mTOP™ Probe with 10GX Hardware Unit + SBC



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, 12V/9Amps Power Supply • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports

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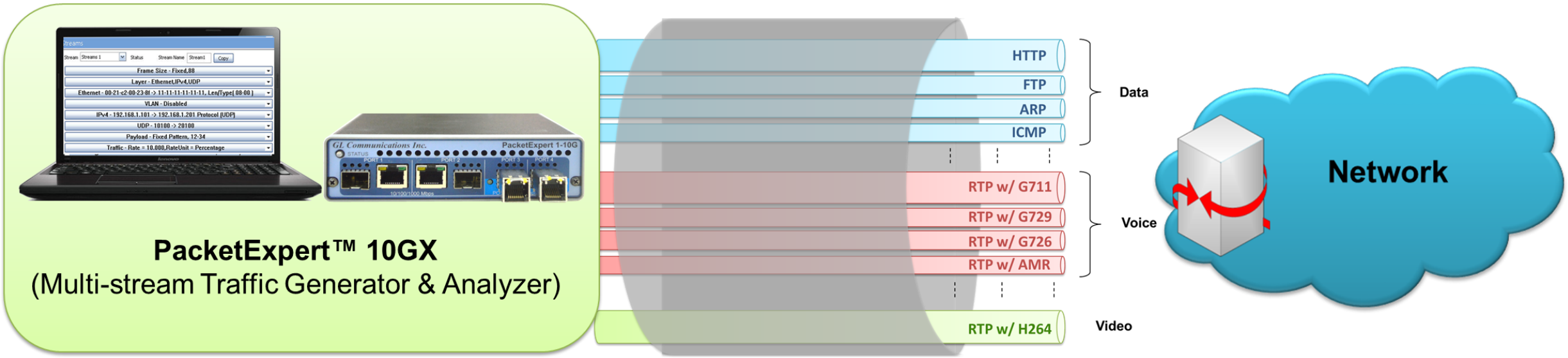
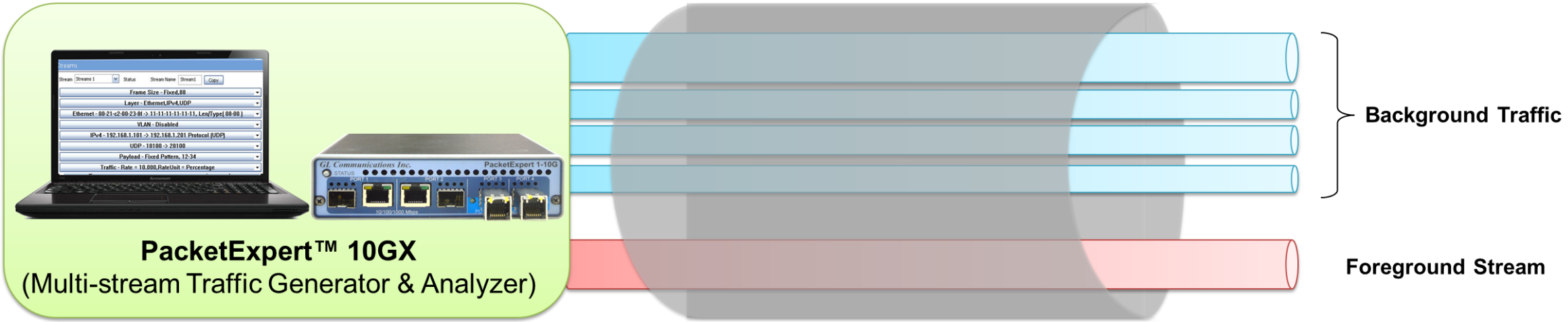
Application Examples

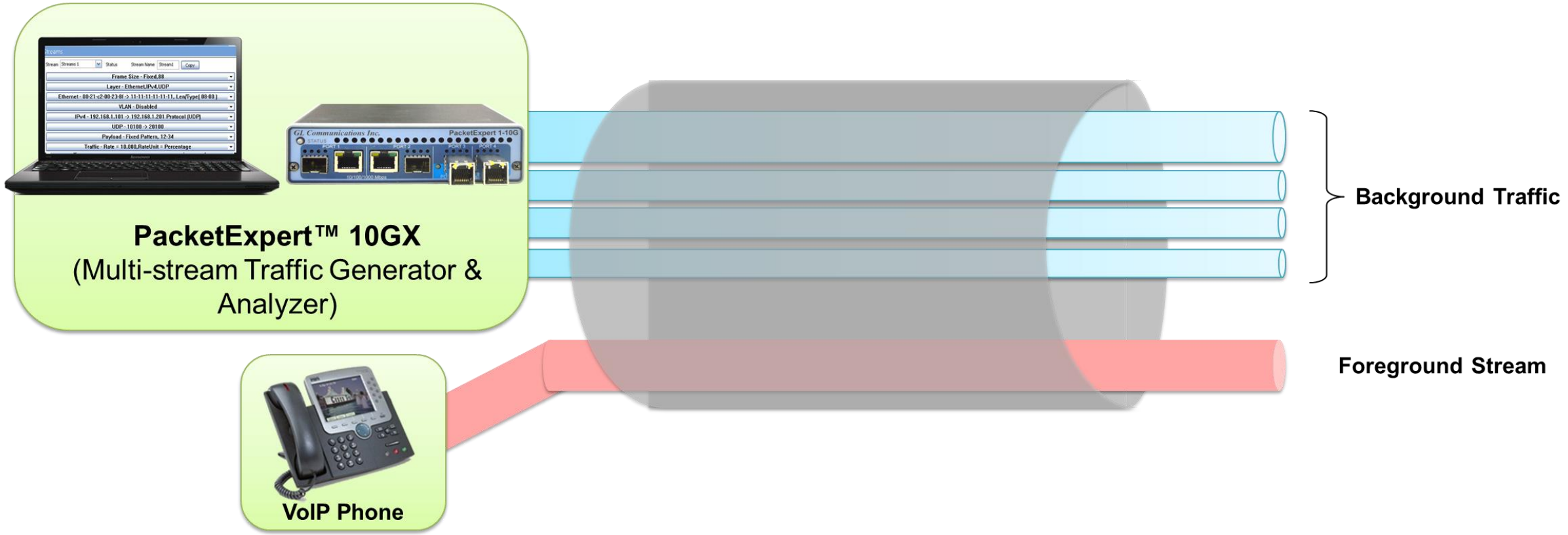
PacketExpert™ in the Network



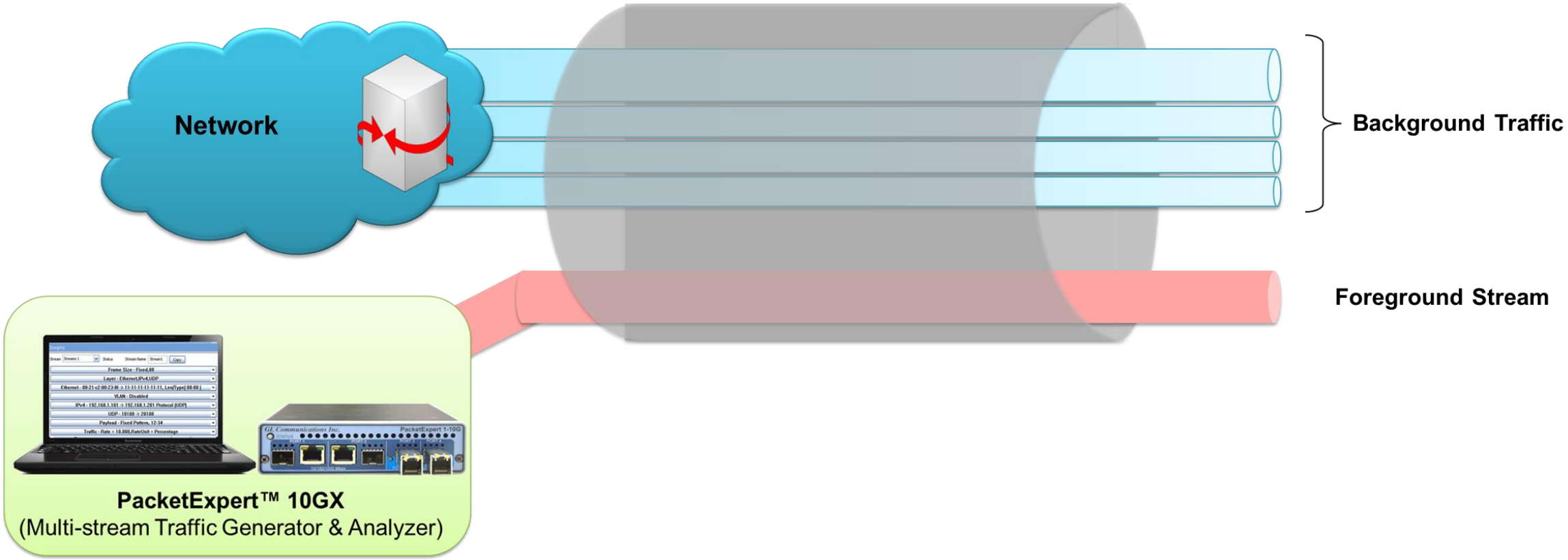
Stress Testing



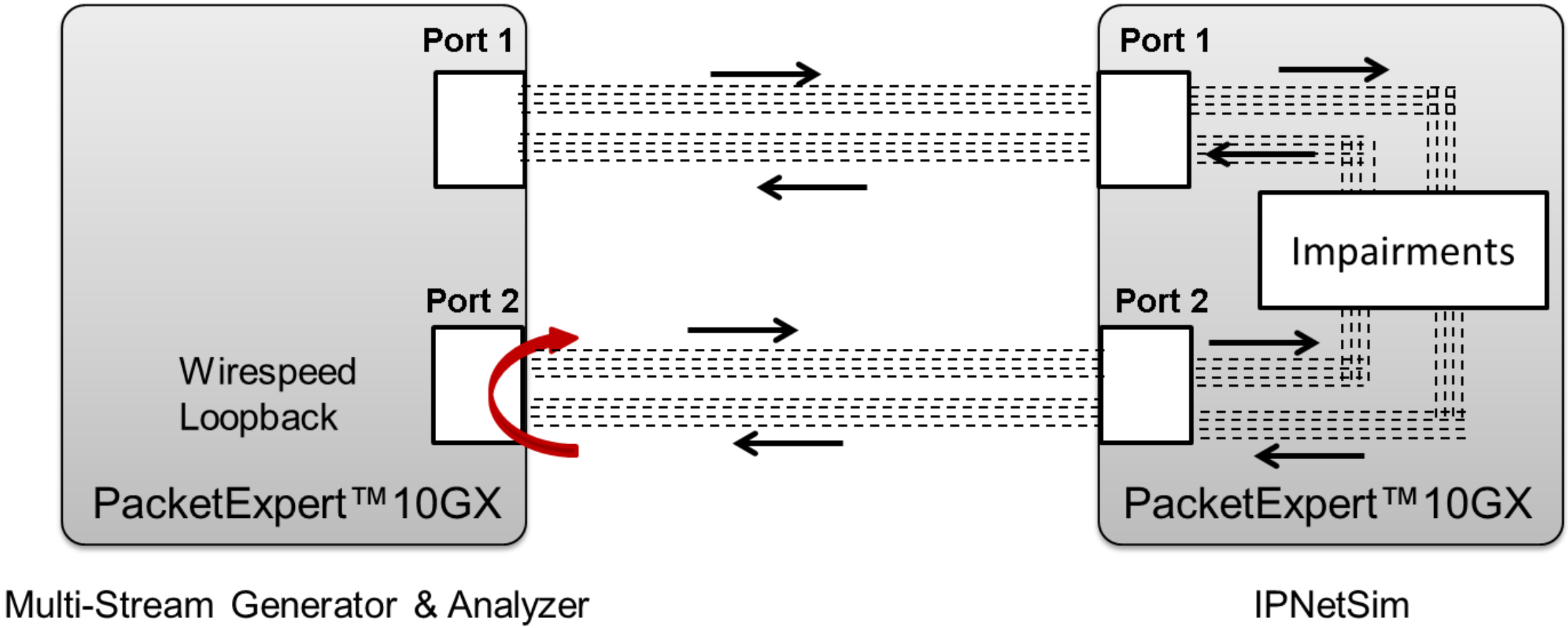
Background Traffic Generator for Stress Testing



Foreground Traffic Generator and Analyzer



Foreground Traffic Generator and Analyzer (Contd.)



Multi-Stream Traffic Generator and Analyzer Results (Horizontal View)

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)	FDV (Min)	FDV (Max)	FDV (Avg)
☑ 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	0.000	0.001	< 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	0.000	0.001	< 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	0.000	< 1us	< 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	< 1us	< 1us	< 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	< 1us	< 1us	< 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	0.000	0.001	< 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	0.000	< 1us	< 1us
☑ 8	55	5 216 779	5 121 928	5 244 854 272	94 851	1.818	792.20	791.97	792.20	1018.53	0.002	0.002	0.003	0.002	< 1us	0.000	< 1us	< 1us
☑ 9	55	1 535 124	1 507 212	771 692 544	27 912	1.818	118.79	118.76	118.79	152.73	0.002	0.001	0.003	0.002	< 1us	0.000	0.001	< 1us
☑ 10	55	3 434 715	3 372 265	674 453 000	62 450	1.818	109.91	109.88	109.91	141.31	0.002	0.001	0.003	0.002	< 1us	0.000	0.001	< 1us
☑ 11	55	3 176 550	3 118 794	405 443 220	57 756	1.818	69.31	69.29	69.31	89.11	0.002	0.001	0.003	0.002	< 1us	0.000	0.001	< 1us
☑ 12	55	9 085 290	8 920 101	1 159 613 130	165 189	1.818	198.22	198.17	198.23	254.86	0.002	0.002	0.003	0.002	< 1us	0.000	< 1us	< 1us
☑ 13	55	9 844 599	9 665 605	5 841 891 662	178 994	1.818	894.11	893.85	894.12	1149.56	0.002	0.001	0.003	0.002	< 1us	0.000	0.001	< 1us
☑ 14	55	27 539 785	27 039 059	16 342 406 346	500 726	1.818	2501.23	2500.50	2501.23	3215.84	0.002	0.001	0.003	0.002	< 1us	0.000	0.001	< 1us
☑ 15	55	395 501	388 310	793 705 640	7 191	1.818	118.74	118.71	118.74	152.66	0.003	0.002	0.003	0.003	< 1us	0.000	< 1us	< 1us
☑ 16	55	1 090 764	1 090 764	658 606 880	0	0.000	98.97	98.94	98.98	129.60	0.002	0.002	0.003	0.002	< 1us	0.000	< 1us	< 1us

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Multi-Stream Traffic Generator and Analyzer Results
(Vertical 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	12	13	14	15	16
Stream Sel...	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Seconds	117	117	117	117	117	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	19 326 942	20 942 205	58 584 795	841 340	2 320 357
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	19 326 942	20 942 204	58 584 795	841 340	2 320 357
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	2 512 502 460	12 657 467	35 408 650	1 719 698 960	1 401 040 198
FL Count	0	0	0	0	0	0	0	0	0	0	0	0	1	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	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	198.23	894.10	2501.23	118.74	98.97
IR (Min)	104.03	98.94	1187.30	247.33	23.79	397.24	2969.39	791.97	118.76	109.88	69.29	198.17	893.85	2500.50	118.71	98.94
IR (Max)	104.06	98.97	1187.65	247.41	23.80	397.36	2970.26	792.20	118.79	109.91	69.31	198.23	894.12	2501.24	118.74	98.98
IR (Avg)	136.79	130.10	1561.28	325.23	31.27	522.37	3904.70	1041.42	156.16	144.49	91.11	260.59	1175.40	3288.12	156.09	130.11
FTD (Curr)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	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	0.002	0.001	0.001	0.002	0.002
FTD (Max)	0.003	0.003	0.003	0.003	0.003	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	0.002	0.002	0.002	0.003	0.002
FDV (Curr)	< 1us	< 1us	< 1us	< 1us	< 1us	< 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	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	< 1us	0.001	0.001	< 1us	< 1us
FDV (Avg)	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us	< 1us

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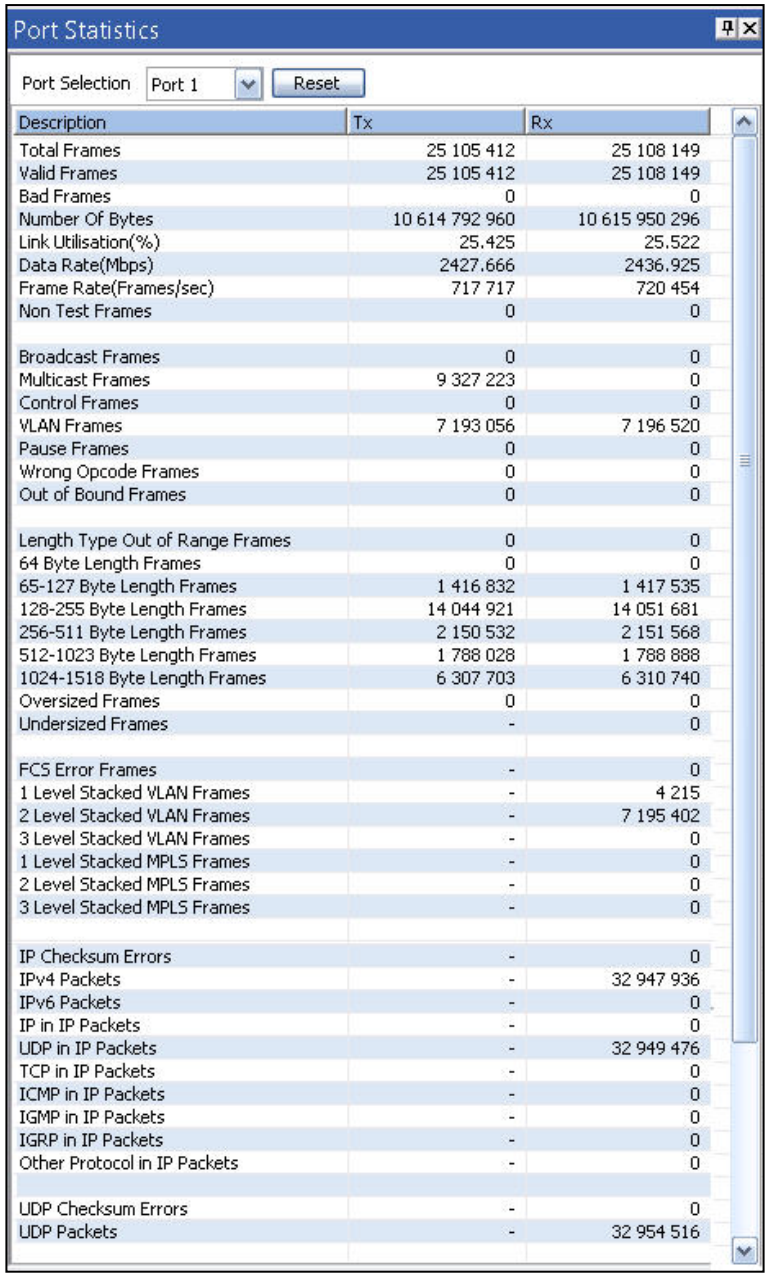
Port Statistics



Description	Tx	Rx
Total Frames	25 105 412	25 108 149
Valid Frames	25 105 412	25 108 149
Bad Frames	0	0
Number Of Bytes	10 614 792 960	10 615 950 296
Link Utilisation(%)	25.425	25.522
Data Rate(Mbps)	2427.666	2436.925
Frame Rate(Frames/sec)	717 717	720 454
Non Test Frames	0	0
Broadcast Frames	0	0
Multicast Frames	9 327 223	0
Control Frames	0	0
VLAN Frames	7 193 056	7 196 520
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	0	0
65-127 Byte Length Frames	1 416 832	1 417 535
128-255 Byte Length Frames	14 044 921	14 051 681
256-511 Byte Length Frames	2 150 532	2 151 568
512-1023 Byte Length Frames	1 788 028	1 788 888
1024-1518 Byte Length Frames	6 307 703	6 310 740
Oversized Frames	0	0
Undersized Frames	-	0
FCS Error Frames	-	0
1 Level Stacked VLAN Frames	-	4 215
2 Level Stacked VLAN Frames	-	7 195 402
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	-	32 947 936
IPv6 Packets	-	0
IP in IP Packets	-	0
UDP in IP Packets	-	32 949 476
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	-	32 954 516

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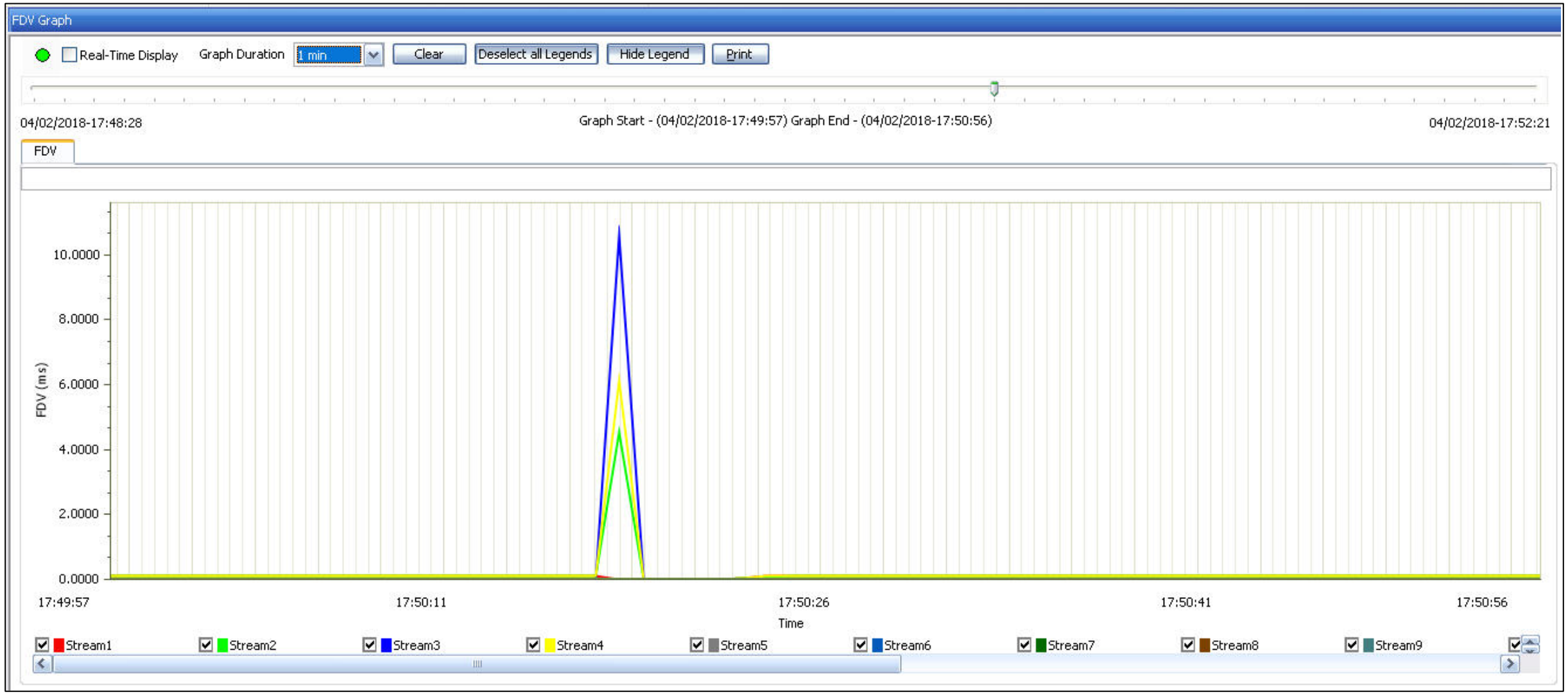
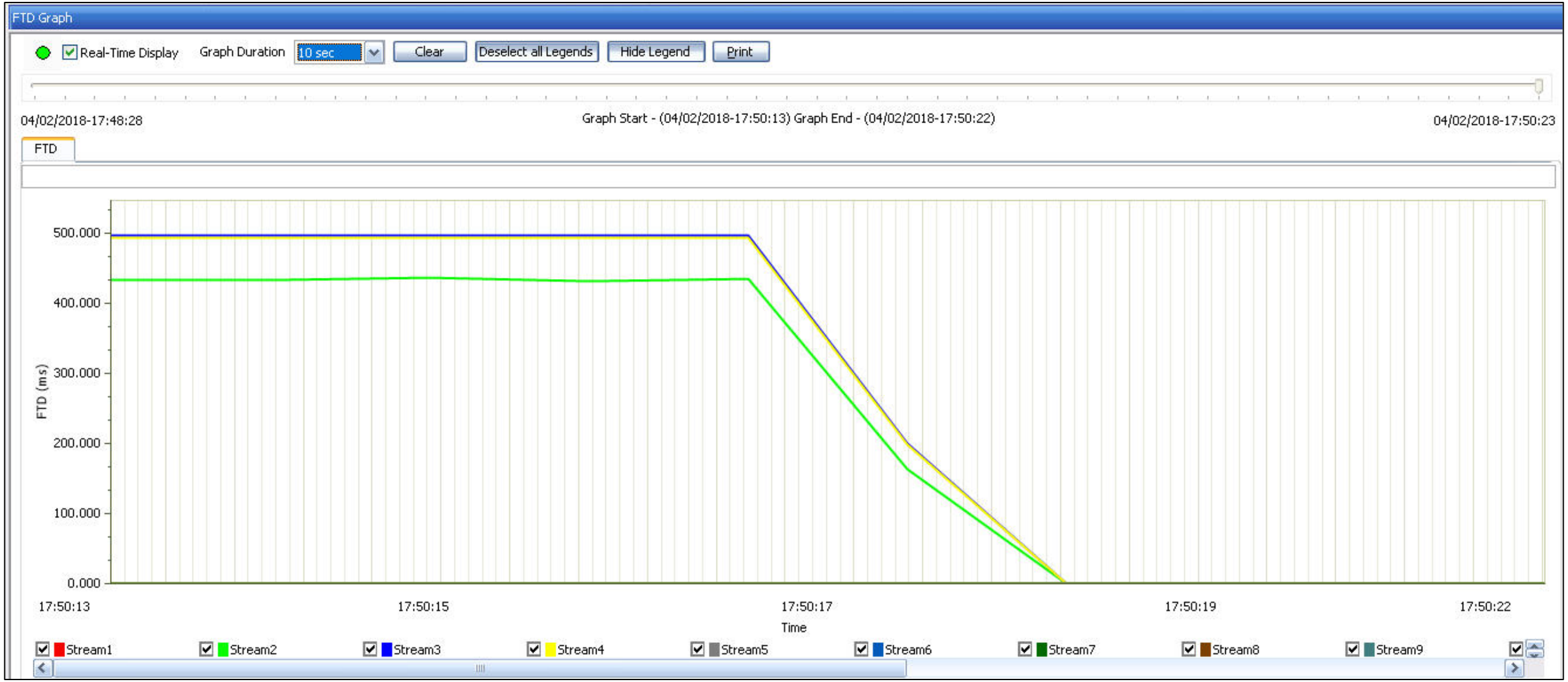
Throughput (IR) Graph

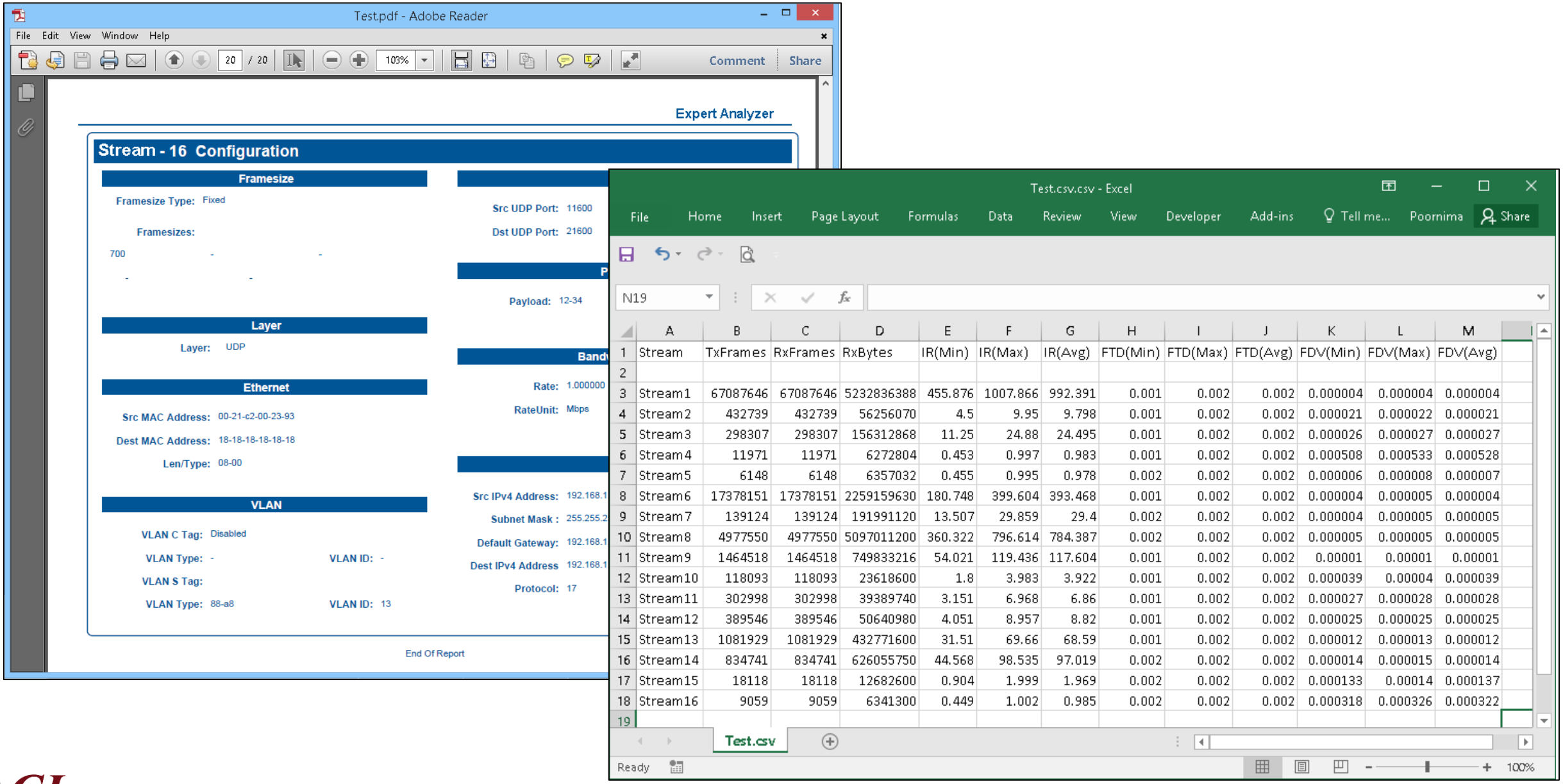
Frame Delay Variation – FDV Graph



Frame Transfer Delay – FTD Graph



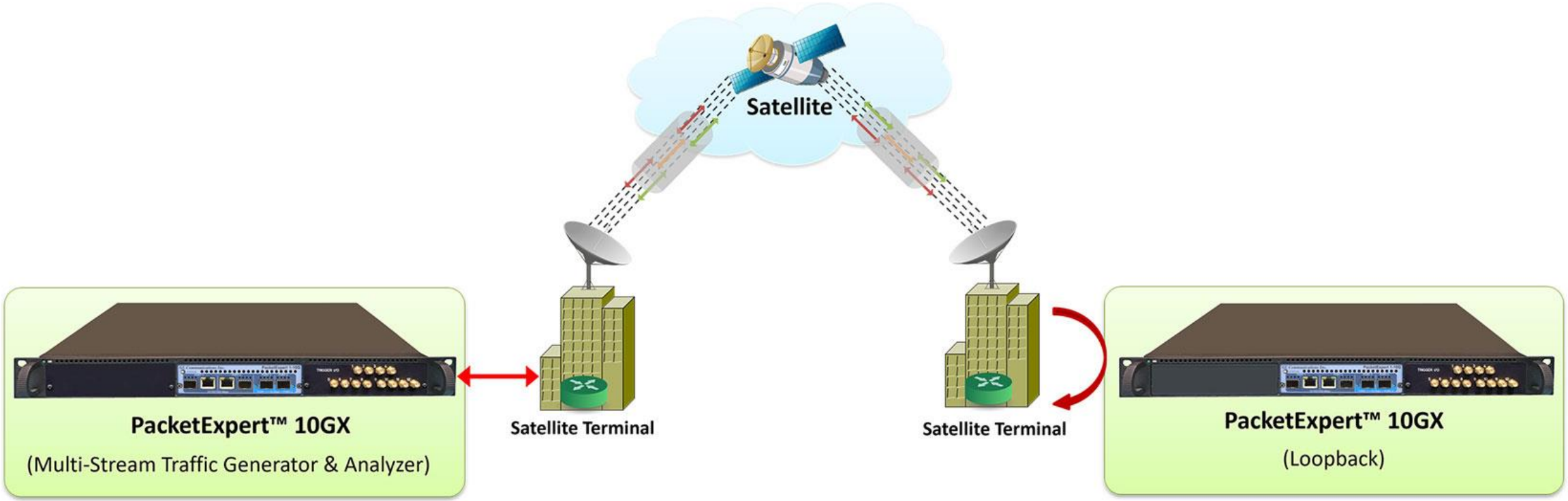
Report Generation in PDF and CSV Format



Stream	TxFrames	RxFrames	RxBytes	IR(Min)	IR(Max)	IR(Avg)	FTD(Min)	FTD(Max)	FTD(Avg)	FDV(Min)	FDV(Max)	FDV(Avg)
Stream1	67087646	67087646	5232836388	455.876	1007.866	992.391	0.001	0.002	0.002	0.000004	0.000004	0.000004
Stream2	432739	432739	56256070	4.5	9.95	9.798	0.001	0.002	0.002	0.000021	0.000022	0.000021
Stream3	298307	298307	156312868	11.25	24.88	24.495	0.001	0.002	0.002	0.000026	0.000027	0.000027
Stream4	11971	11971	6272804	0.453	0.997	0.983	0.001	0.002	0.002	0.000508	0.000533	0.000528
Stream5	6148	6148	6357032	0.455	0.995	0.978	0.002	0.002	0.002	0.000006	0.000008	0.000007
Stream6	17378151	17378151	2259159630	180.748	399.604	393.468	0.001	0.002	0.002	0.000004	0.000005	0.000004
Stream7	139124	139124	191991120	13.507	29.859	29.4	0.002	0.002	0.002	0.000004	0.000005	0.000005
Stream8	4977550	4977550	5097011200	360.322	796.614	784.387	0.002	0.002	0.002	0.000005	0.000005	0.000005
Stream9	1464518	1464518	749833216	54.021	119.436	117.604	0.001	0.002	0.002	0.00001	0.00001	0.00001
Stream10	118093	118093	23618600	1.8	3.983	3.922	0.001	0.002	0.002	0.000039	0.00004	0.000039
Stream11	302998	302998	39389740	3.151	6.968	6.86	0.001	0.002	0.002	0.000027	0.000028	0.000028
Stream12	389546	389546	50640980	4.051	8.957	8.82	0.001	0.002	0.002	0.000025	0.000025	0.000025
Stream13	1081929	1081929	432771600	31.51	69.66	68.59	0.001	0.002	0.002	0.000012	0.000013	0.000012
Stream14	834741	834741	626055750	44.568	98.535	97.019	0.002	0.002	0.002	0.000014	0.000015	0.000014
Stream15	18118	18118	12682600	0.904	1.999	1.969	0.002	0.002	0.002	0.000133	0.00014	0.000137
Stream16	9059	9059	6341300	0.449	1.002	0.985	0.002	0.002	0.002	0.000318	0.000326	0.000322

GL Communications

Traffic Generation over Satellite Networks



Thank you