Wirespeed Ethernet Packet Capture & Playback
(1 Gbps, 2.5 Gbps, or 10 Gbps)

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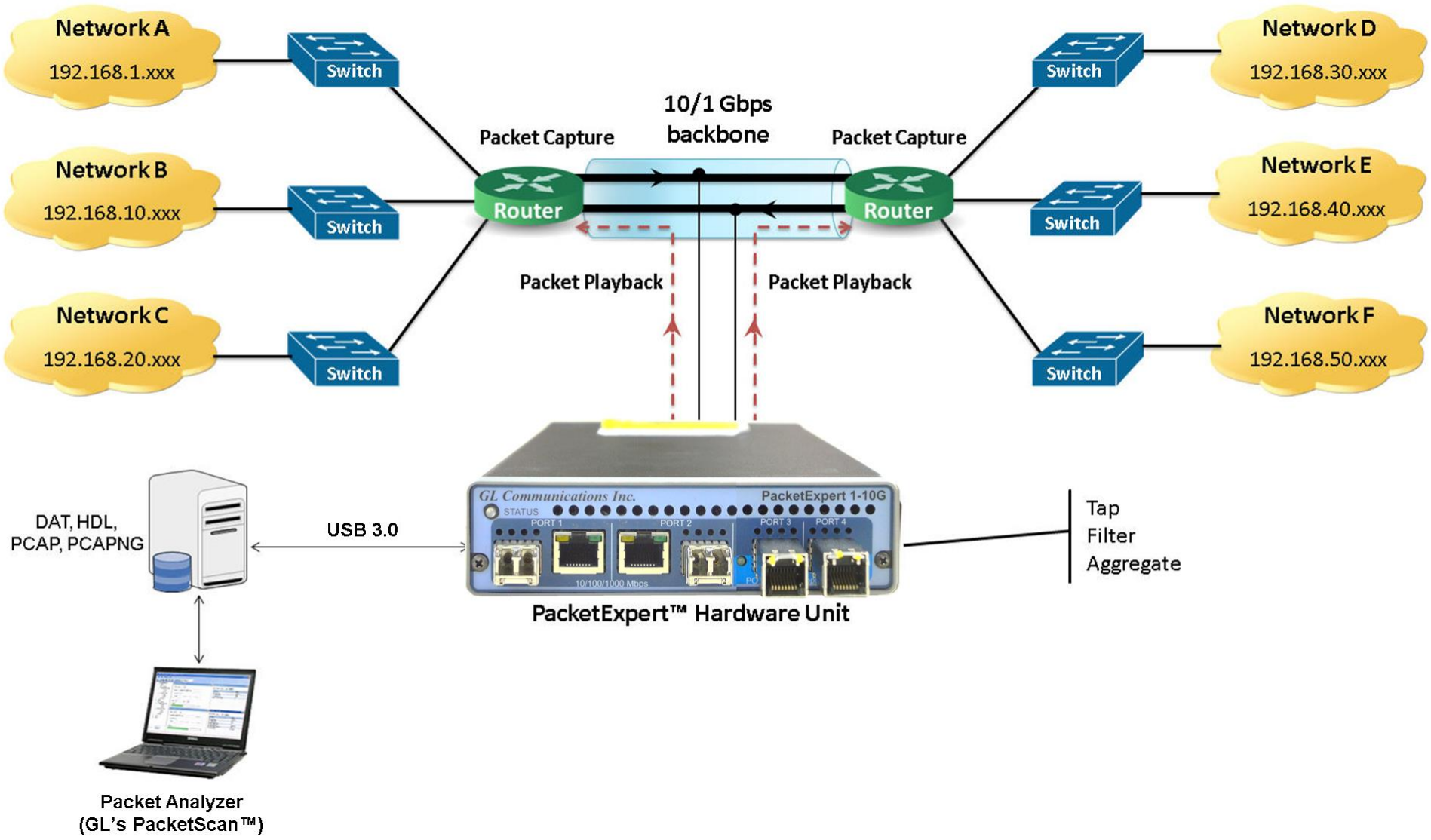
Non-Intrusive Tapping of Electrical or Optical Lines



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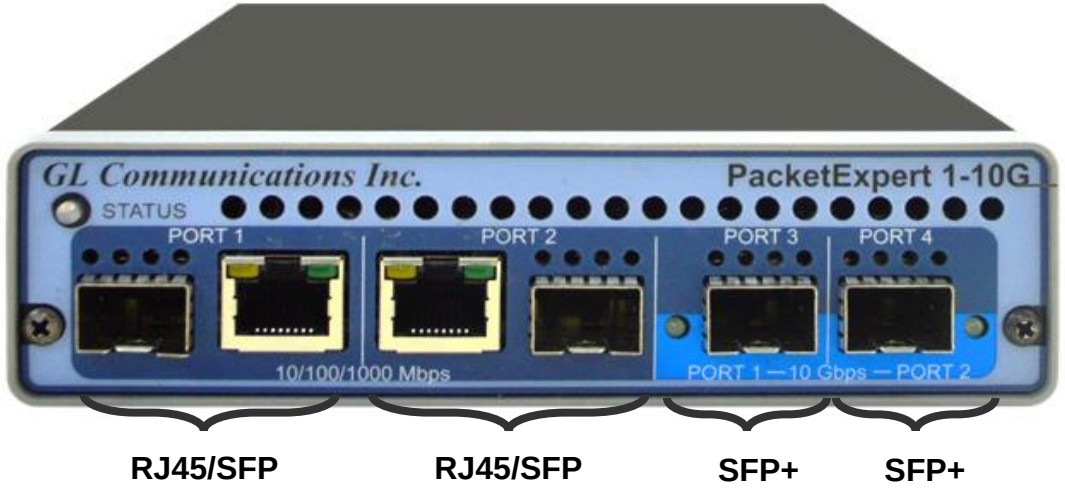
PacketExpert™ 10GX - Portable Unit (PXN100, PXN101)



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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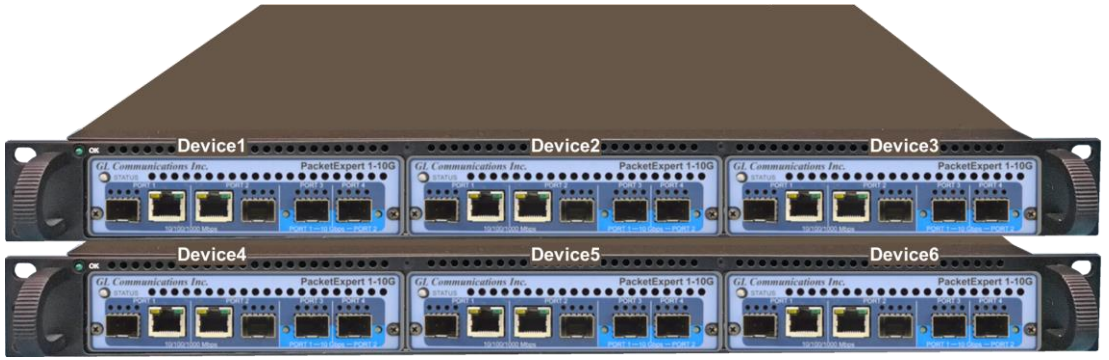
MTOP™ Rack Units

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

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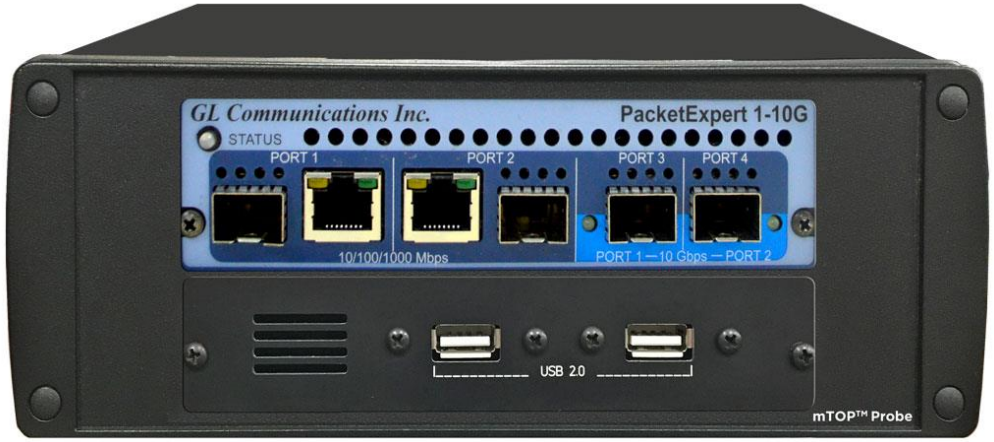
mTOP™ Probe with 10GX Hardware Unit + SBC



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

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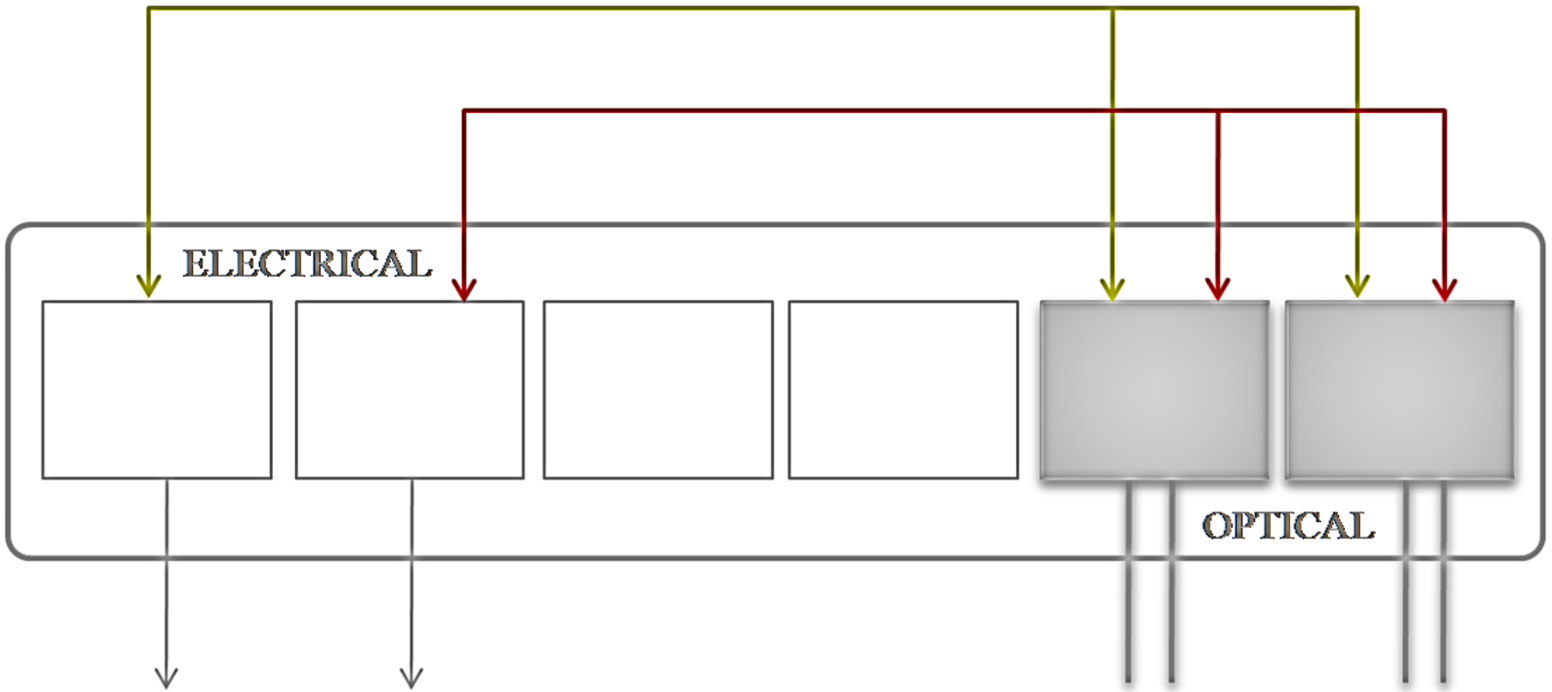
Electrical to Optical Converter



To Electrical 1G ports on PacketExpert™ for Monitoring

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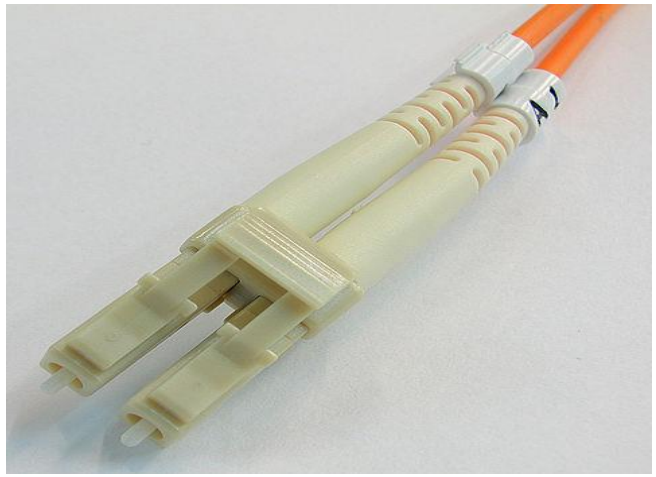
Optical Connectors and SFP Transceivers

LC Connectors

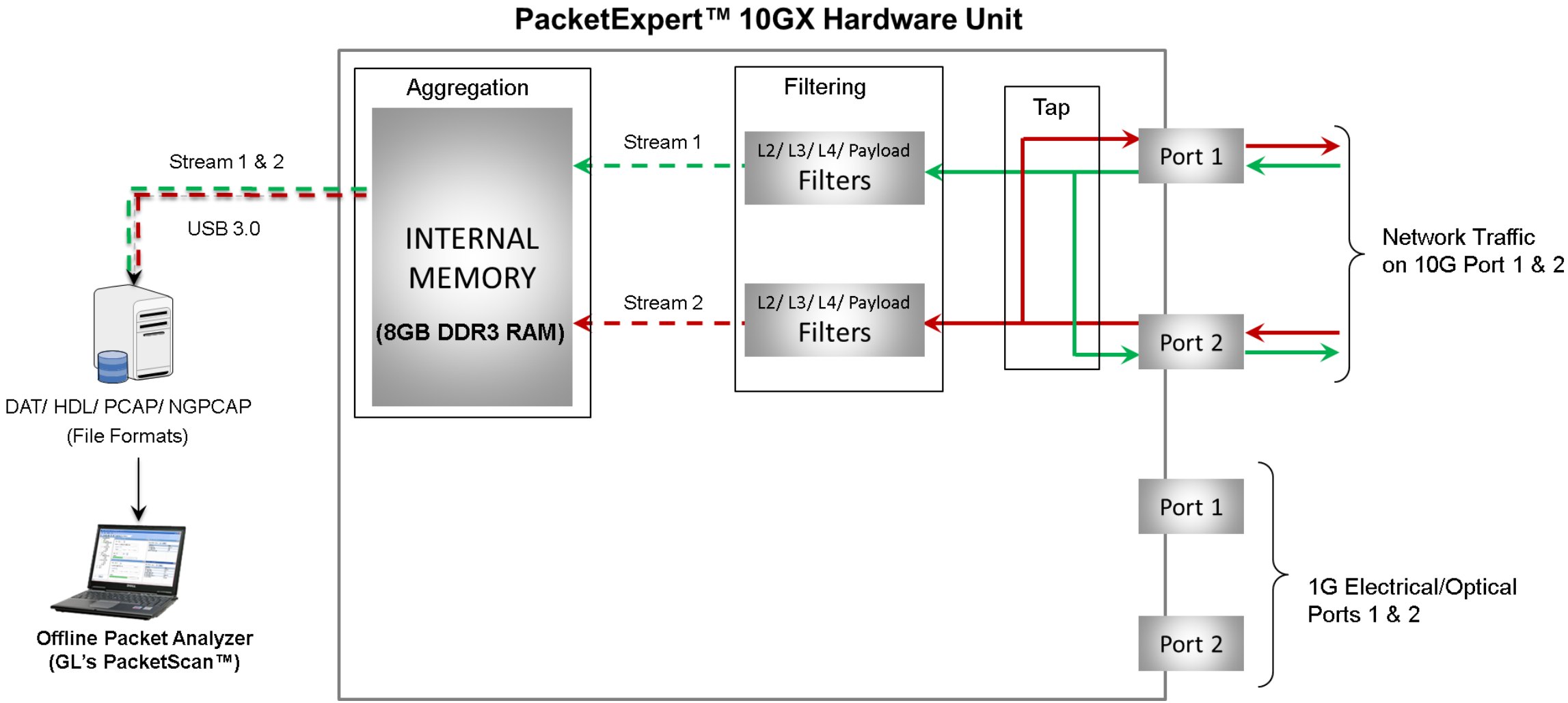


850nm/1310nm/1550nm SFP Module

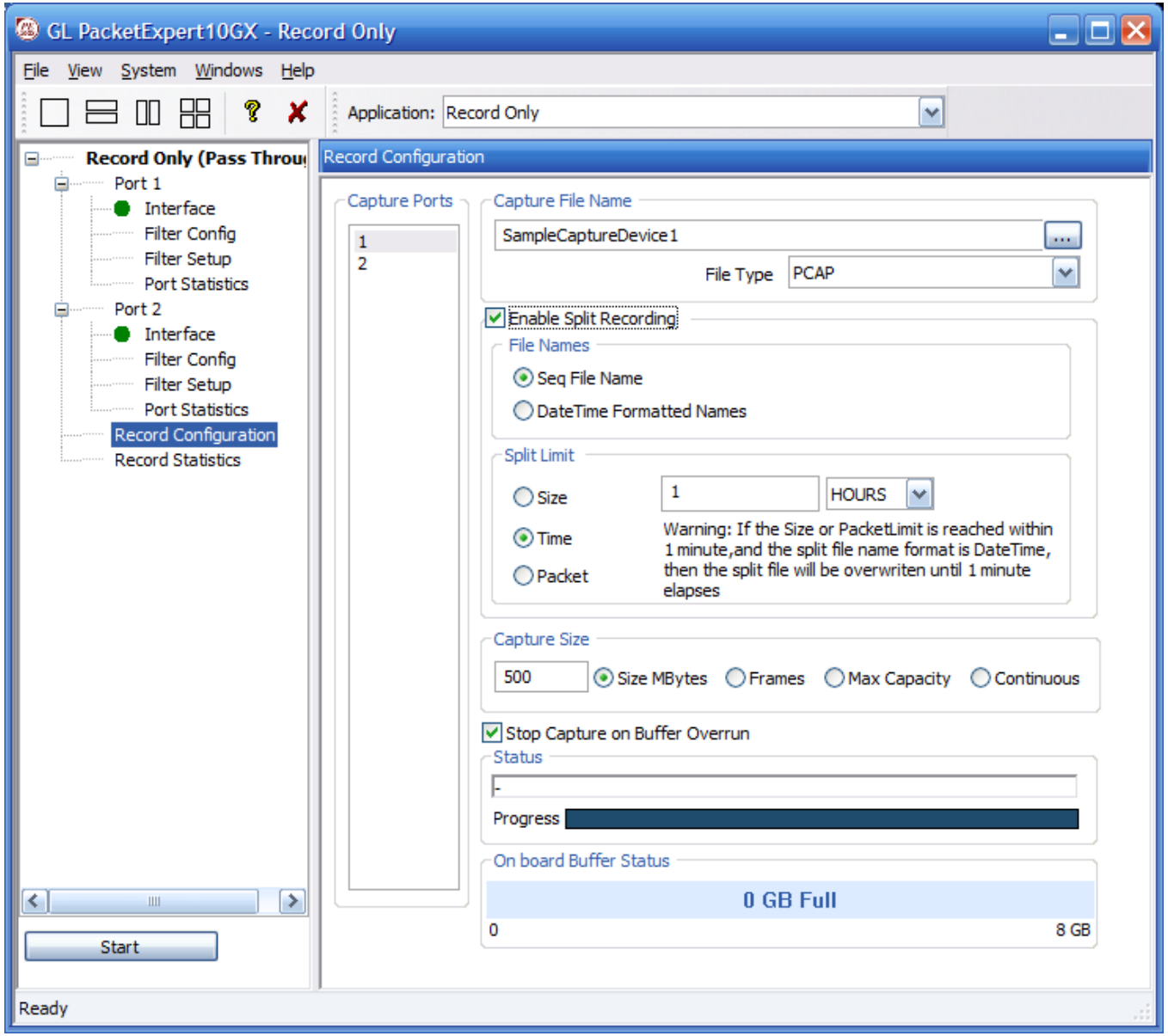
- PacketExpert™ 10GX supports LC connectors and 850nm/1310nm/1550nm SFP (Small Factor Pluggable) modules

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

Working Principle



Record Only Application



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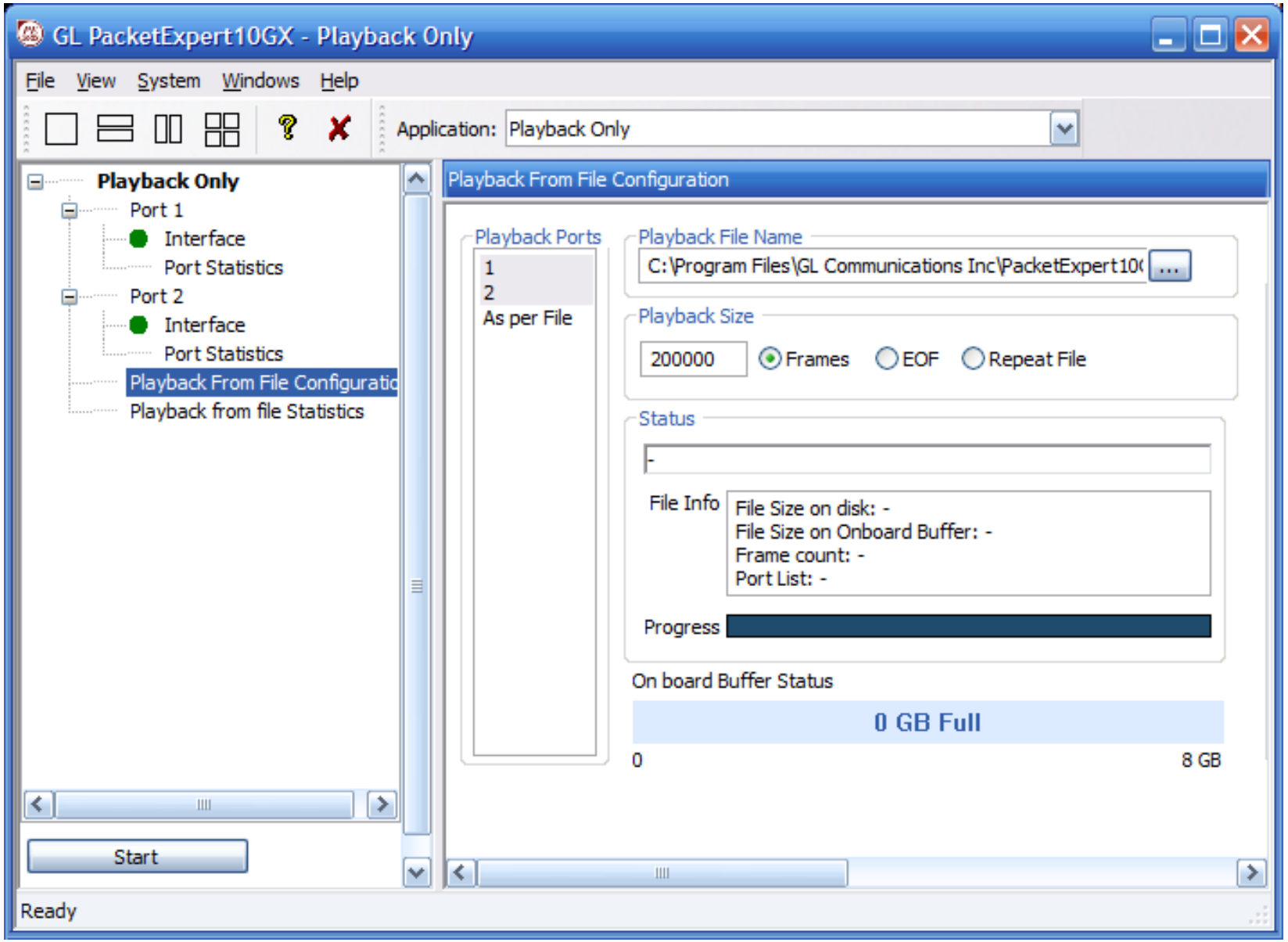
Playback Only Application



Working Principle

The tap, filter, and aggregation modes of PacketExpert™ 10G Record Playback are detailed below:

- **Tap:** Traffic is forwarded between the 10G/1G pass-through ports (Port 1 and Port 2) without any modification or delay
- **Filter:** wire-speed filtering of L2/L3/L4 packets, with each port featuring up to 16 simultaneous filters each of 120 bytes in length. Filter can be set to any offset within the packet, which gives flexibility to filter any header field as well as the payload
- **Aggregation:** Alternatively, the filtered traffic from both 10G/1G Port 1 and Port 2 can be aggregated to present them as a single stream. This aggregated stream is saved to the onboard 8 GB memory card (SD) in any of the following file formats (DAT, HDL, PCAP, NGPCAP). Then the data is transferred to the PC at USB 3.0 (up to 1 Gbps) rate, which can be later used for offline analysis

Record/Playback Application

- **Record Only mode**
  - capture packets to files simultaneously on 2 ports and on either port
  - onboard 8 GB memory is available for wirespeed capture
- **Playback Only mode**
  - playback on up to 2 ports simultaneously
  - onboard 8 GB memory is available for transmission

Features

Record Packets to File

- Comprehensive receive testing capabilities
- Records the received packets into a file up to hard drive capacity (limited by disk write speed)
- Packets can be captured continuously (till user manually stops the capture or up to hard drive capacity) or limited by a specified size in MB, specified packet count, or specified time duration
- Supported output file formats are *.pcap, *.hdl, *.dat, and *.pcapng/*.ntar
- Result count includes the total number of packets received by the port as well as the host, dropped packet, number of bytes written to the file, disk write buffer utilization, and disk write bytes/sec
- Provides Port level statistics like total frames/bytes received, Rx Frame rate, Rx Data rate etc.
- Test non-intrusively with electrical and optical ports
- DDR3 memory size of 8GB
- Record is based on time-stamp

Features (Contd.)

Playback from File

- Playback packets from the captured or pre-recorded files
- Playback can be done on both the ports simultaneously
- Each port can transmit a file separately and independently. ‘As per File’ option allows the users to playback the traffic exactly the same way as it was captured
- Captured traffic on one port can be transmitted on the same or any other port – will be redirected to the correct port at run time
- Packets can be transmitted either continuously, limited by number of packets, or till the end-of-file (EOF)
- Packets transmission is from USB 3.0 to DDR3 and playback is based on time-stamp depending on the captured rate
- Supported file formats are DAT (.dat - GL proprietary), HDL (.hdl - GL Proprietary and can be used for offline analysis by GL’s PacketScan™), PCAP (.pcap - used by Wireshark®) and NGPCAP (.pcapng/.ntar – next generation Wireshark®) formats
- Displays some useful statistics that help user to check the progress of the playback

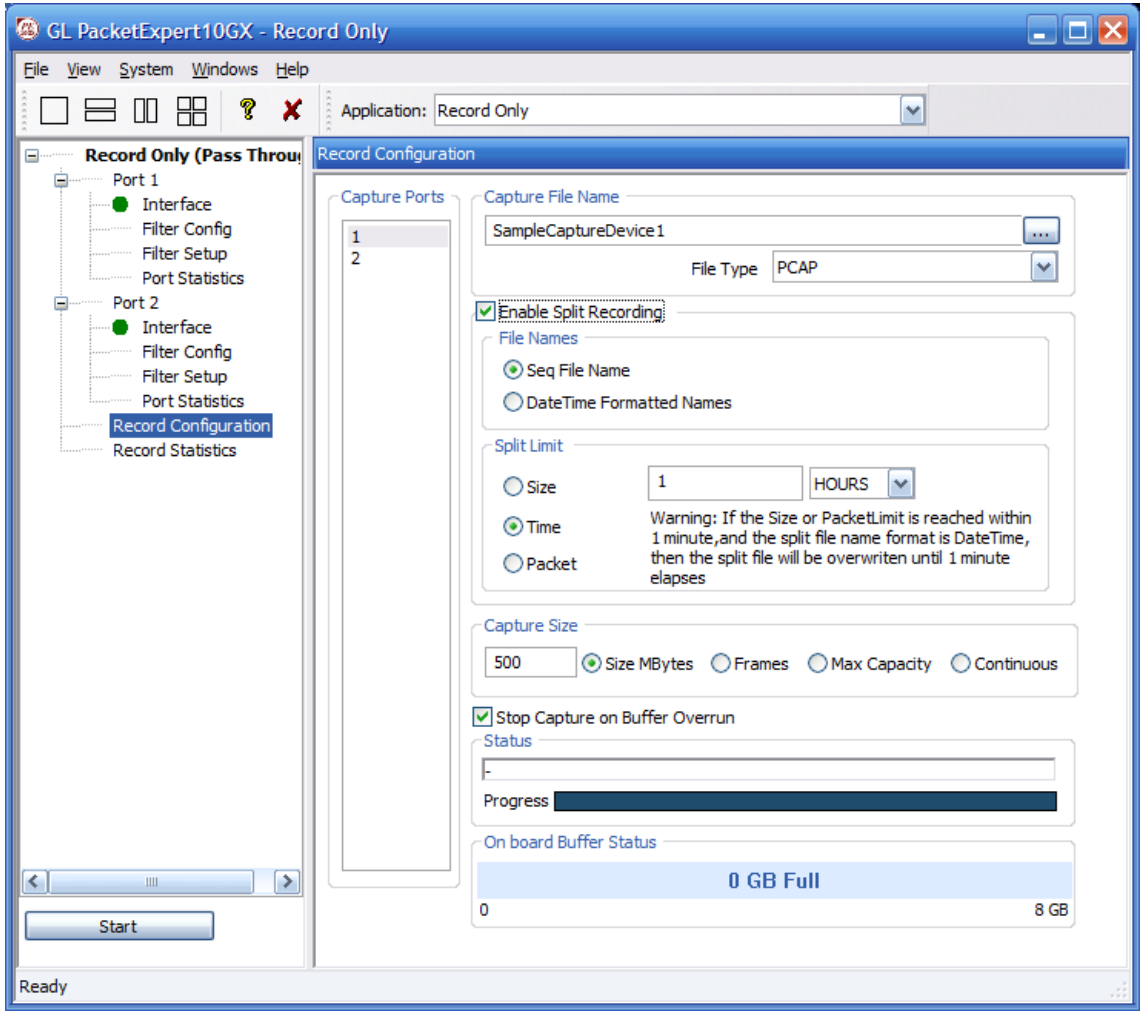
Limitations

- The overall transmit rate is limited to the USB 3.0 transfer rate (rate of data transfer from host to hardware via the USB 3.0 interface)

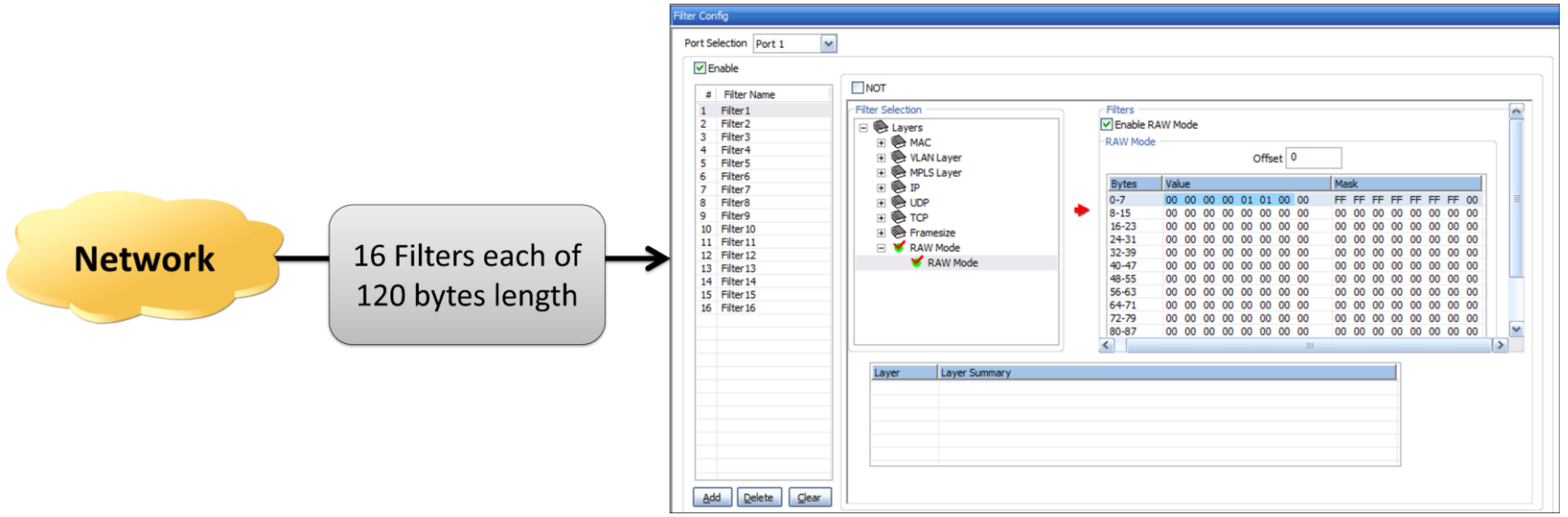
- Transmit rate can go up to 1 Gbps depending on the host PC configuration

Configuration - Record Only Mode

- Receive ports: supports ports 1 & 2 for capturing in record only mode
- Output File: Record file name (HDL, PCAP, DAT, PCAPNG format)
- Output File Limit: Limit after which Rx will stop. Size in MB or Number of packets, or Continuous capture
- Status: Status message
- Progress: Test progress
- Buffer status: DDR3 memory status (max 8GB)

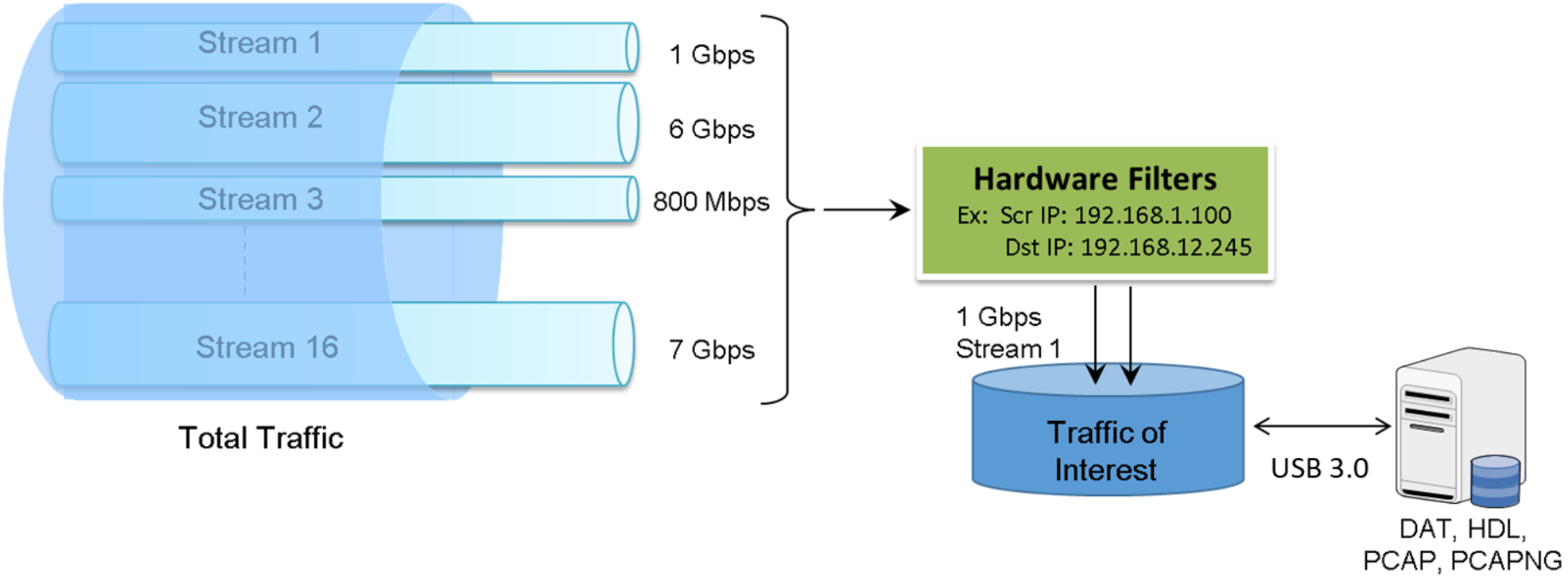


Wirespeed Packet Filters and Triggers



- 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



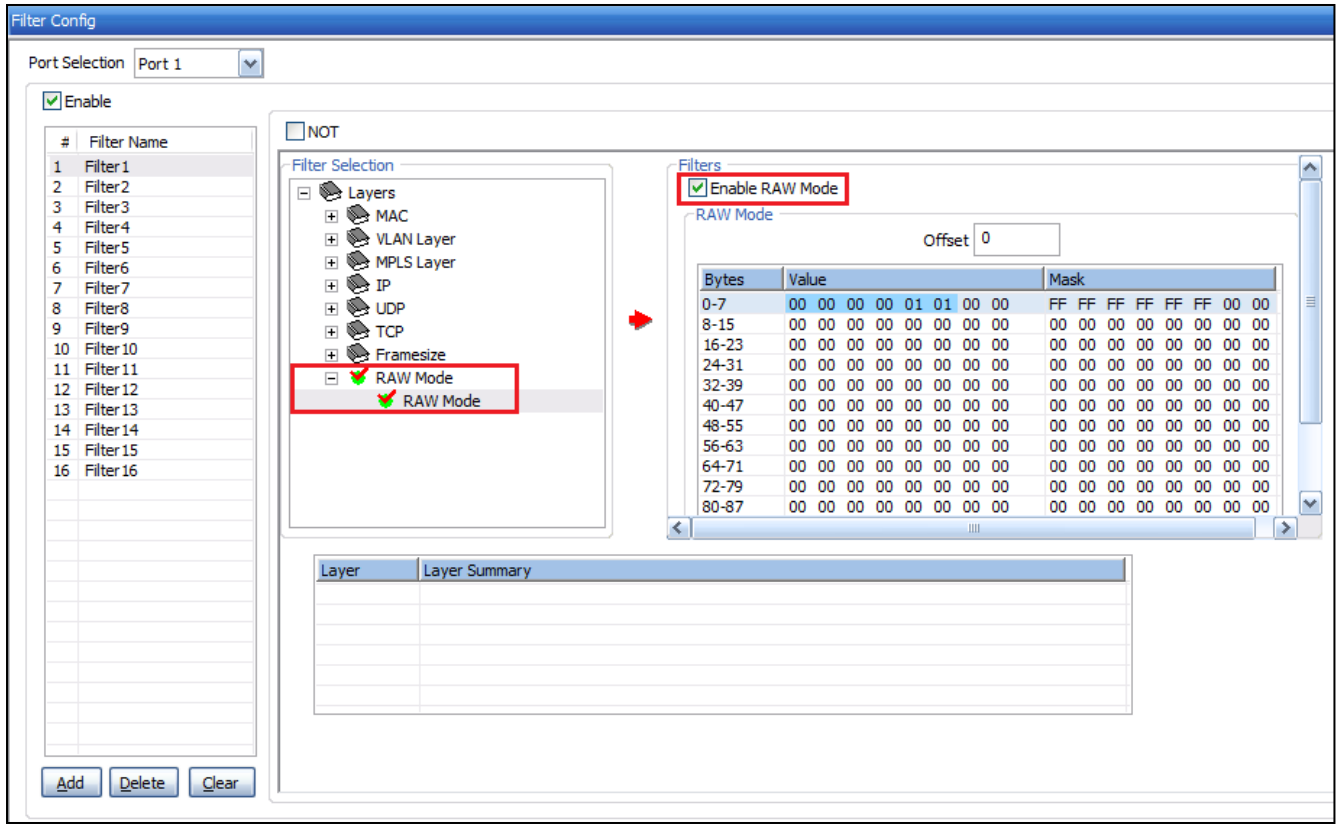
The network traffic containing n streams of varying data rate is filtered at the PacketExpert™ hardware as per the filter settings. The overall transmit rate is limited to the USB 3.0 transfer rate.

Transmit rate can go up to 1 Gbps depending on the host PC configuration.

Wirespeed Filter - Record Only Mode

Raw Mode Filter Option

- Each bit can be set to ‘filtered’ or ‘don’t care’ condition via filter mask
- Filter can be set to any offset within the packet, which gives flexibility to filter particular fields within protocol headers. Eg: Source/Destination MAC Address, Source/Destination IP Address etc.
- Capture simultaneously on 2 optical or electrical GigE ports and on either port user can set filter up to 120 bytes in length
- Record statistics display includes Capture Duration, Total Rx Frames, Frames not matched to filter, Frames matched to filter, Overflowed Frames, Overflowed Count, Transferred Frames, Disk Write Rate (bytes/sec), Disk Write Buffer Utilization (%), and Capture File Size



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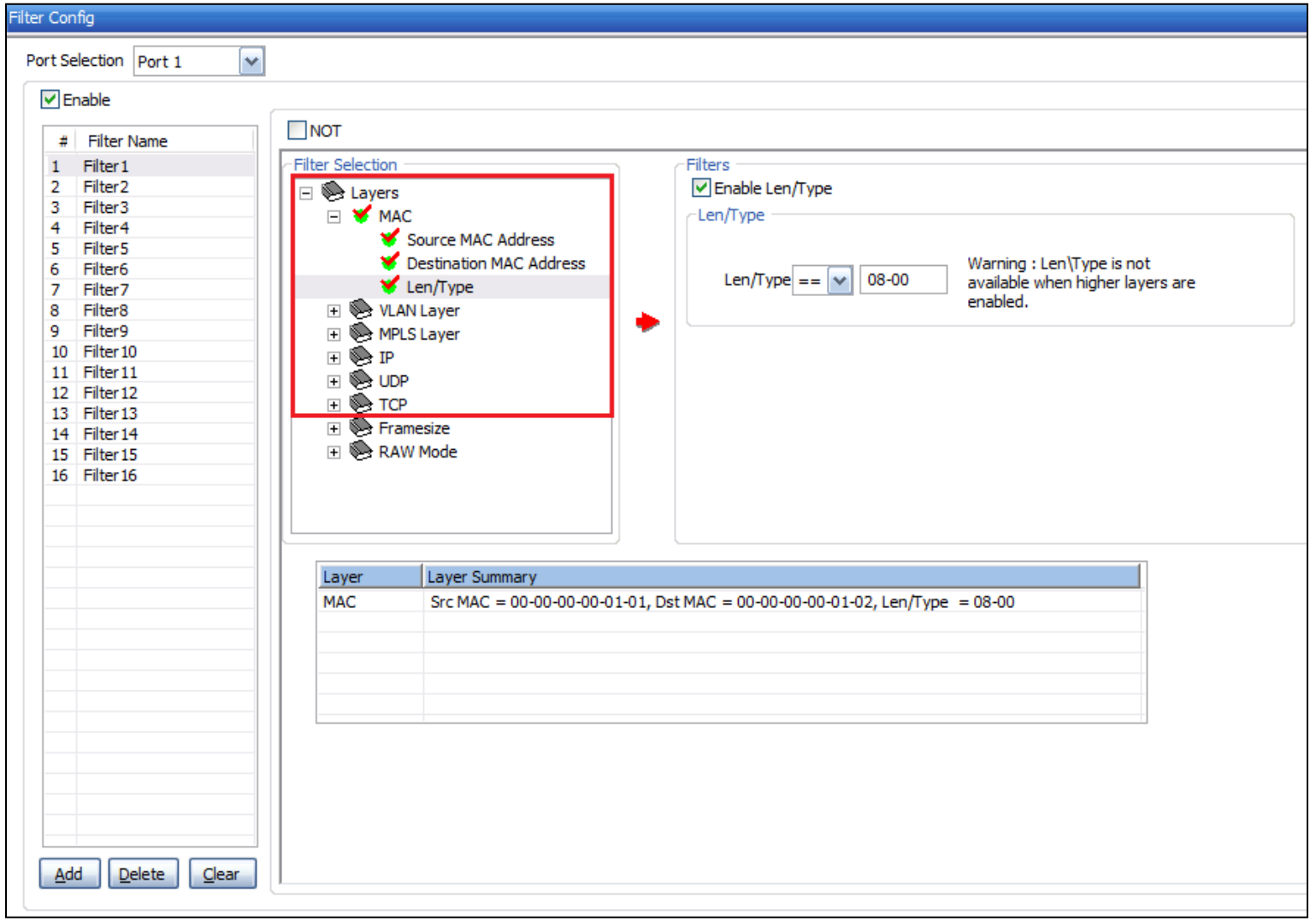
Wirespeed Filter - Record Only Mode

Packet Mode Filter Option



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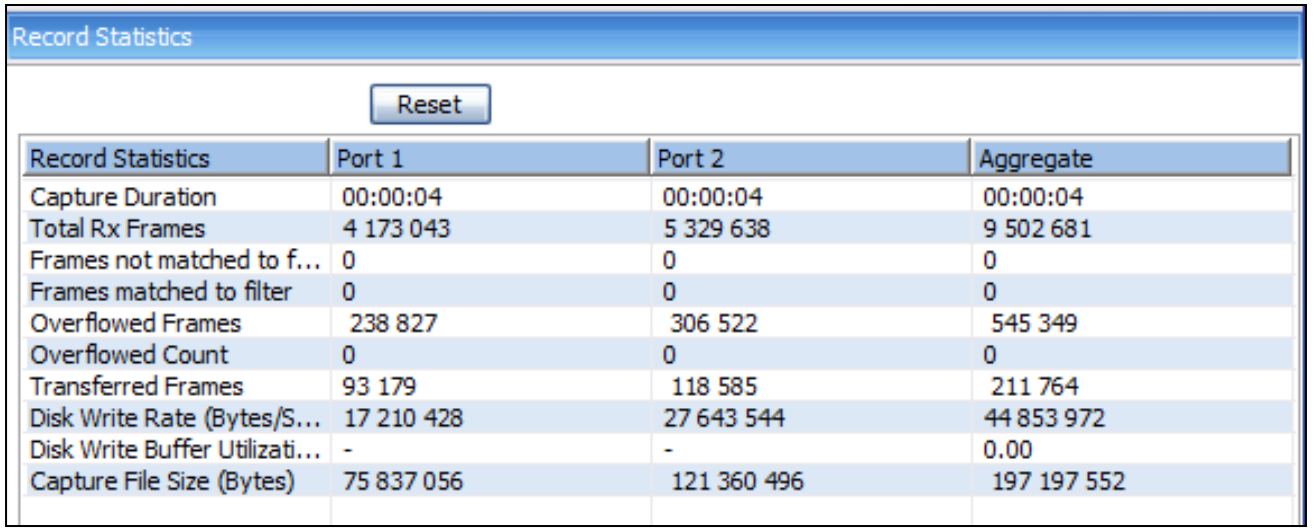
Results – Record Only Mode

Port wise Results



Record Statistics	Port 1	Port 2	Aggregate
Capture Duration	00:00:04	00:00:04	00:00:04
Total Rx Frames	4 173 043	5 329 638	9 502 681
Frames not matched to f...	0	0	0
Frames matched to filter	0	0	0
Overflowed Frames	238 827	306 522	545 349
Overflowed Count	0	0	0
Transferred Frames	93 179	118 585	211 764
Disk Write Rate (Bytes/S...	17 210 428	27 643 544	44 853 972
Disk Write Buffer Utilizati...	-	-	0.00
Capture File Size (Bytes)	75 837 056	121 360 496	197 197 552

- Capture Duration: Test time
- Rx Frames (Port): Total number of frames received(includes filter fail, filter pass, dropped frame count)
- Filter Fail Frame count: Number of frames failed the filter criteria
- Filter Pass Frame count: Number of frames passed the filter criteria
- Dropped frame count: Number of frames dropped due to DDR3 memory overflow
- Rx Frames(USB): Number of frames transferred to USB from the port
- Disk Write bytes/sec: Number of bytes written to the disk per second (Bytes/sec)
- File Bytes Written: Total number of bytes written to the disk

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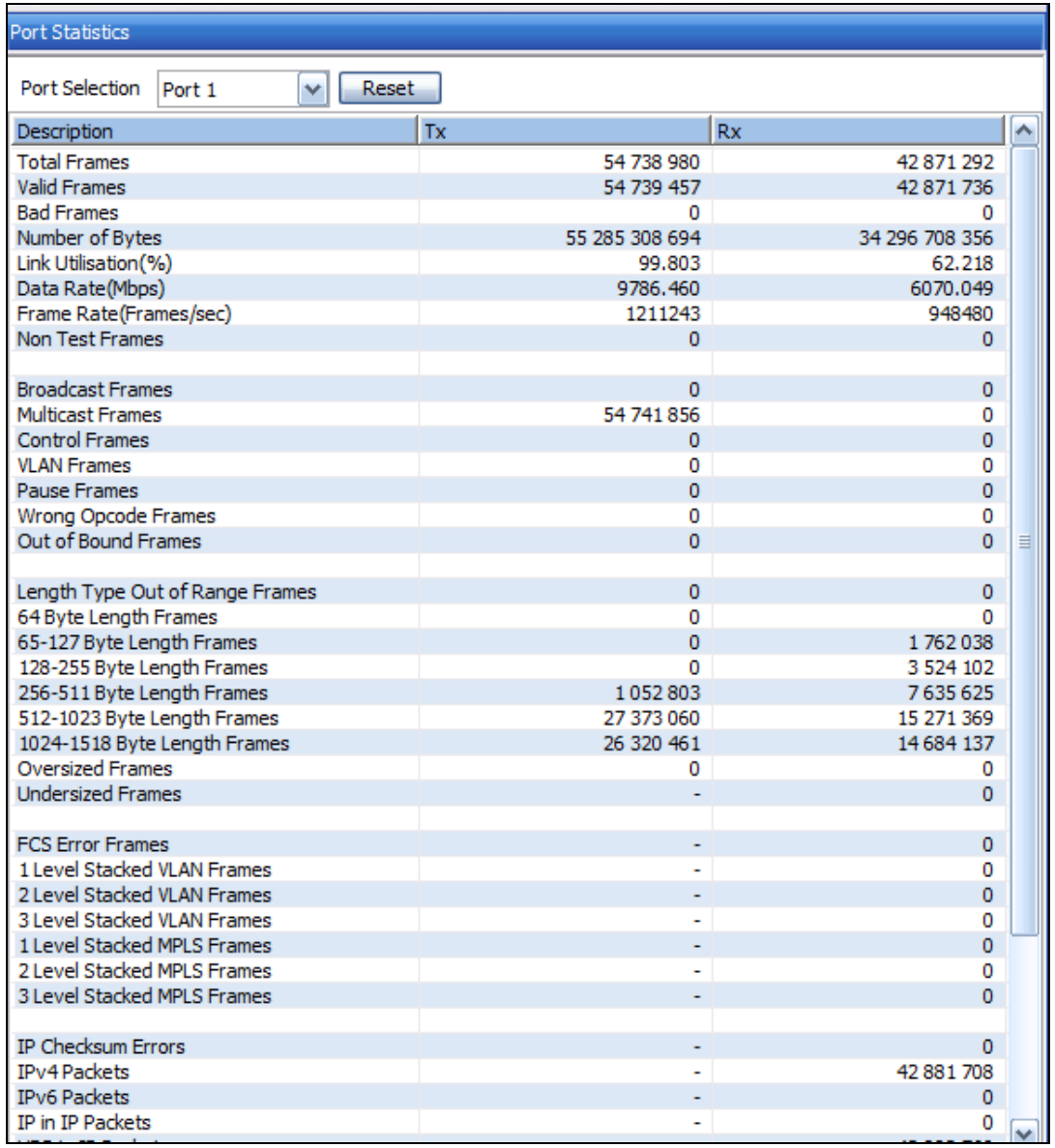
Statistics – Record Only Mode



Description	Tx	Rx
Total Frames	54 738 980	42 871 292
Valid Frames	54 739 457	42 871 736
Bad Frames	0	0
Number of Bytes	55 285 308 694	34 296 708 356
Link Utilisation(%)	99.803	62.218
Data Rate(Mbps)	9786.460	6070.049
Frame Rate(Frames/sec)	1211243	948480
Non Test Frames	0	0
Broadcast Frames	0	0
Multicast Frames	54 741 856	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	0	0
65-127 Byte Length Frames	0	1 762 038
128-255 Byte Length Frames	0	3 524 102
256-511 Byte Length Frames	1 052 803	7 635 625
512-1023 Byte Length Frames	27 373 060	15 271 369
1024-1518 Byte Length Frames	26 320 461	14 684 137
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	-	42 881 708
IPv6 Packets	-	0
IP in IP Packets	-	0

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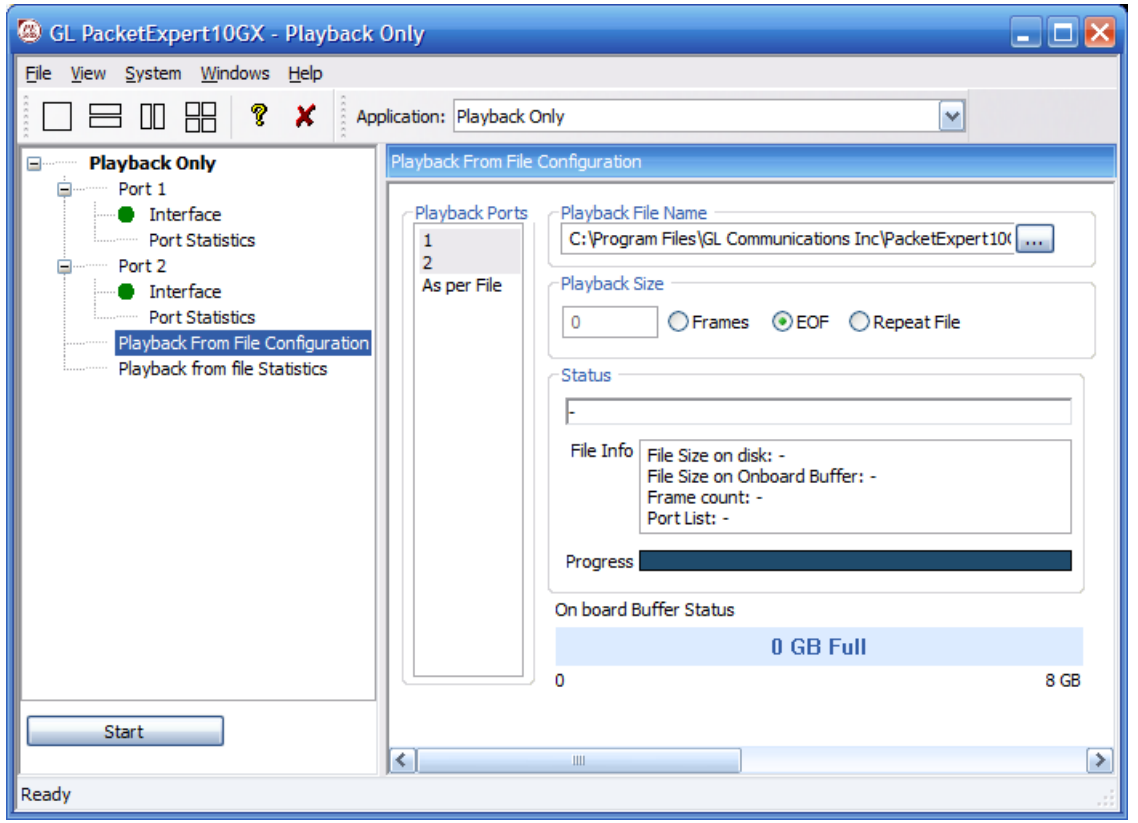
Configuration – Playback Only Mode



- Transmit ports: User has to select the ports to transmit. Supported on port 1, 2, ‘As per File’ option allows the users to playback the traffic exactly the same way as it was captured
- File Name: Name of the file to playback (DAT, HDL, PCAP)
- Transmission limit: Number of packets, EOF and continuous
- Buffer status: DDR3 memory status (max 8GB)

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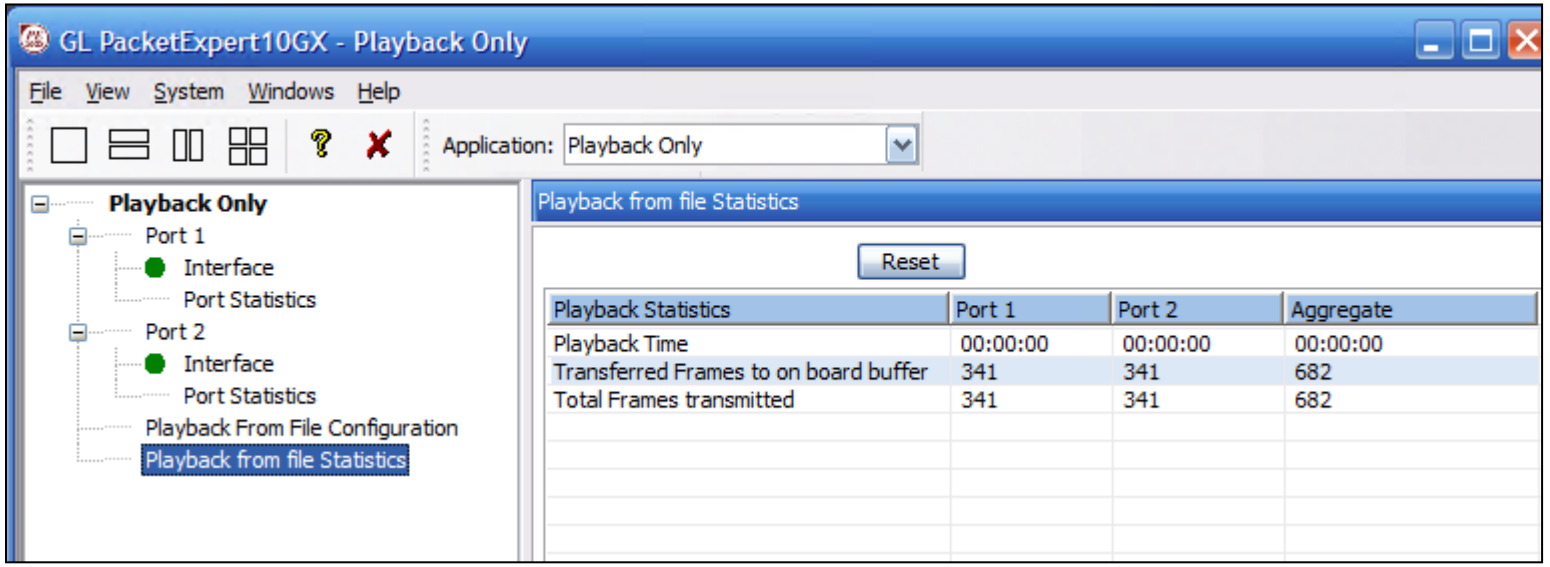
Results - Playback Only Mode

Aggregate Results



- Playback Time – Displays total test run time duration. During playback, the relative timestamps for each packet transmitted is maintained exactly like in the source file. Since playback happens in the hardware, it can achieve microsecond accuracy in maintaining the timestamps
- Transferred Frames to Board Buffer - Displays number of frames transferred to the Buffer
- Tx Frames transmitted – Displays actual frames transmitted out of the physical port

	PacketExpert™ 10GX	PacketExpert™ 1G
Record Only	• Capture packets non-intrusively over 10G Optical ports and 10/100/1000 Mbps Electrical/Optical ports at nano-second precision.	• Capture packets non-intrusively over 10/100/1000 Mbps Electrical/Optical ports at nano-second precision.
	• Wirespeed capture and storage can be accomplished utilizing the onboard DDR3 memory size of 8GB	• Wirespeed capture and storage can be accomplished utilizing the onboard DDR2 memory size of 2GB
	• Up to 120 bytes wide filter that covers almost entire packet up to UDP	• Up to 40 bytes wide filter that covers almost entire packet up to UDP
	• Hardware based Wirespeed filtering at full line rate • Tapping (Pass through mode), and Tap-Filter-Aggregate modes • Recording can be done on multiple ports simultaneously • Supported file formats for recording are *.pcap, *.hdl, *.dat, and *.pcapng/*.ntar • Supports raw-mode and packet-mode filtering for greater flexibility • Packets can be captured continuously (till user manually stops the capture or up to hard drive capacity) or limited by a specified size in MB, packet count, time duration, or capture continuously (until the disk is full) • Result count includes the total number of packets received by the port as well as the host, dropped packet, number of bytes written to the file, disk write buffer utilization, and disk write bytes/sec • Provides Port level statistics like total frames/bytes received, Rx Frame rate, Rx Data rate etc. • Supports 16 filters per SFP / Ethernet port • Filter on various header fields like Source/Destination MAC Address, VLAN Id, MPLS Label, Source/Destination Ipv4 Address, Source/Destination UDP ports	

	PacketExpert™ 10GX	PacketExpert™ 1G
Playback Only	• Wirespeed playback can be accomplished utilizing the onboard DDR3 memory size of 8GB	• Wirespeed playback can be accomplished utilizing the onboard DDR2 memory size of 2GB
	• Packets transmission is from USB3.0 to Onboard memory buffer up to 8 GB and playback is based on time-stamp depending on the captured rate	• Packets transmission is from USB2.0 to Onboard memory buffer up to 4 GB and playback is based on time-stamp depending on the captured rate
	• Playback packets from the captured or pre-recorded files • Playback can be done on both ports simultaneously • Each port can transmit a file separately and independently. 'As per File' option allows the users to playback the traffic exactly the same way as it was captured • Captured traffic on one port can be transmitted on the same or any other port – will be redirected to the correct port at run time • Packets can be transmitted either continuously, limited by number of packets, or till the end-of-file (EOF) • Highly accurate Playback based on the recorded nanosecond timestamp • Supported file formats are DAT (.dat - GL proprietary), HDL (.hdl - GL Proprietary and can be used for offline analysis by GL's PacketScan™), PCAP (.pcap - used by Wireshark®) and PCAP-NG (.pcapng/.ntar – next generation Wireshark®) formats • Supports Pause frame transmission with user defined quanta on each port independently • Displays some useful statistics that help user to check the progress of the playback	
Record and Playback	• Supports both record to a file and playback from the file on the two 10G or 1G ports simultaneously • It can work in Tap, Filter, and Aggregation mode • Onboard 4 GB memory each is available for capturing and transmission of data respectively	• Supports both record to a file and playback from the file on three 1G simultaneously • It can work in Tap, Filter, and Aggregation mode • Onboard 1 GB memory each is available for capturing and transmission of data respectively
Record and Playback (per port)	• Not Supported	• Both record and playback actions can be performed simultaneously on a single port • Each of the ports function independently • Onboard 1 GB memory each is available for capturing and transmission of data respectively

Thank you