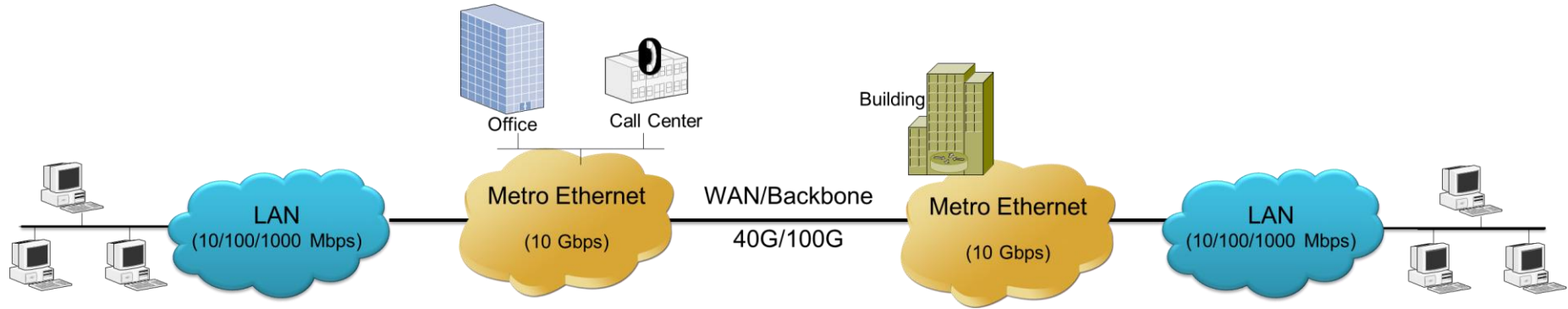

PacketExpert™ – PacketBroker™

(Wire-speed Ethernet Tap)

 ***GL Communications Inc.***

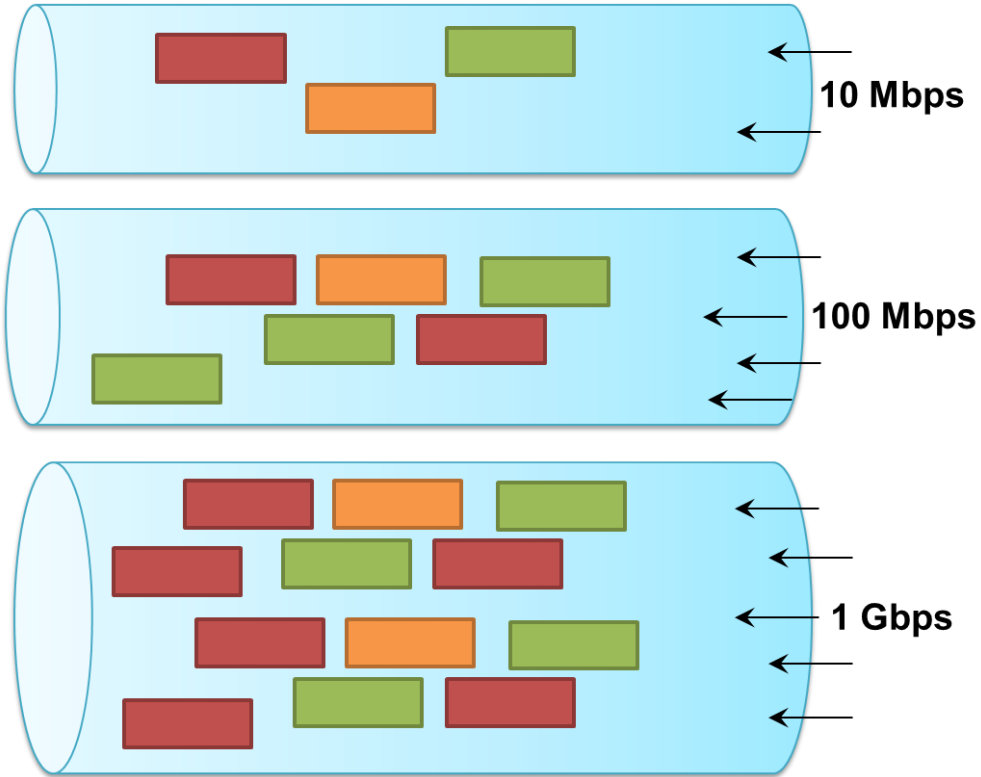
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <https://www.gl.com>

Ethernet Technology

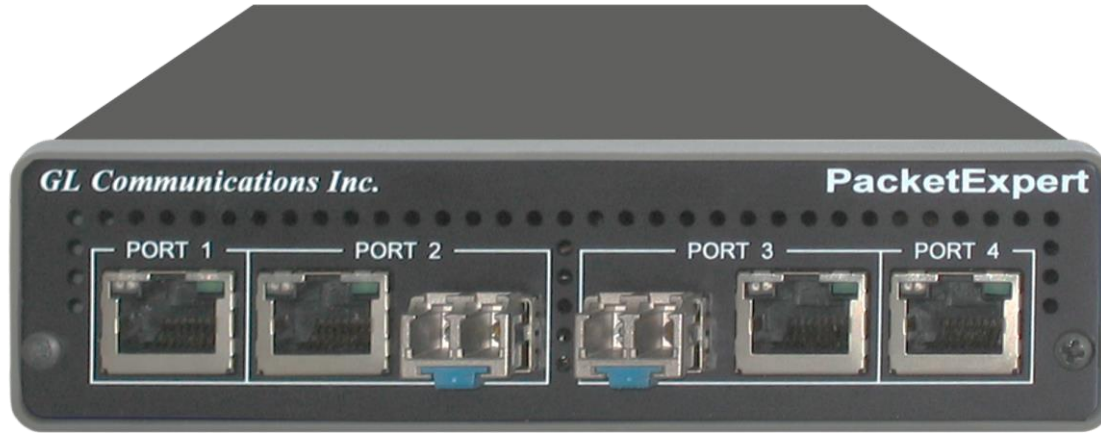


- Ethernet has become ubiquitous in both Local Area Networks and Wide Area Networks
- Network engineers require the ability to capture the traffic at different locations in the network

Just bigger Pipes, but same Ethernet packets

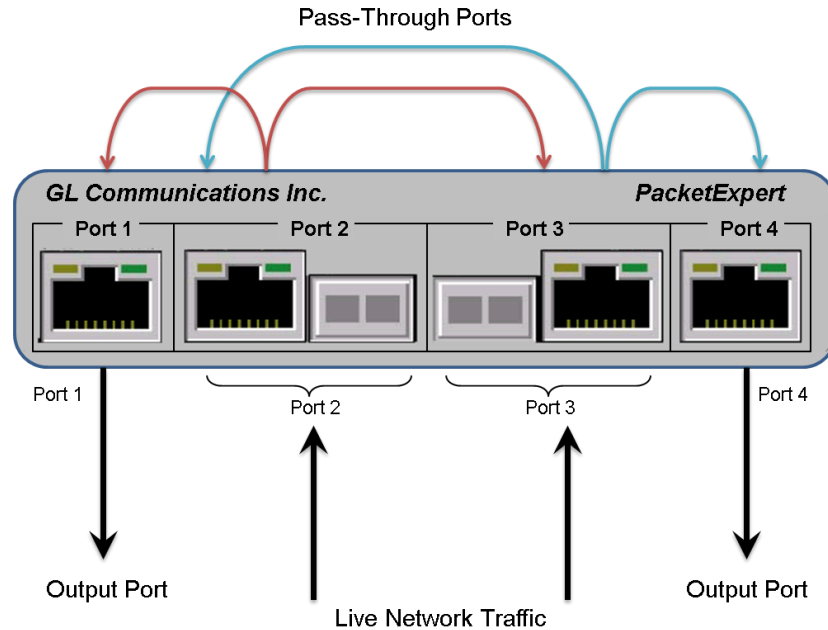


PacketExpert™ 1G



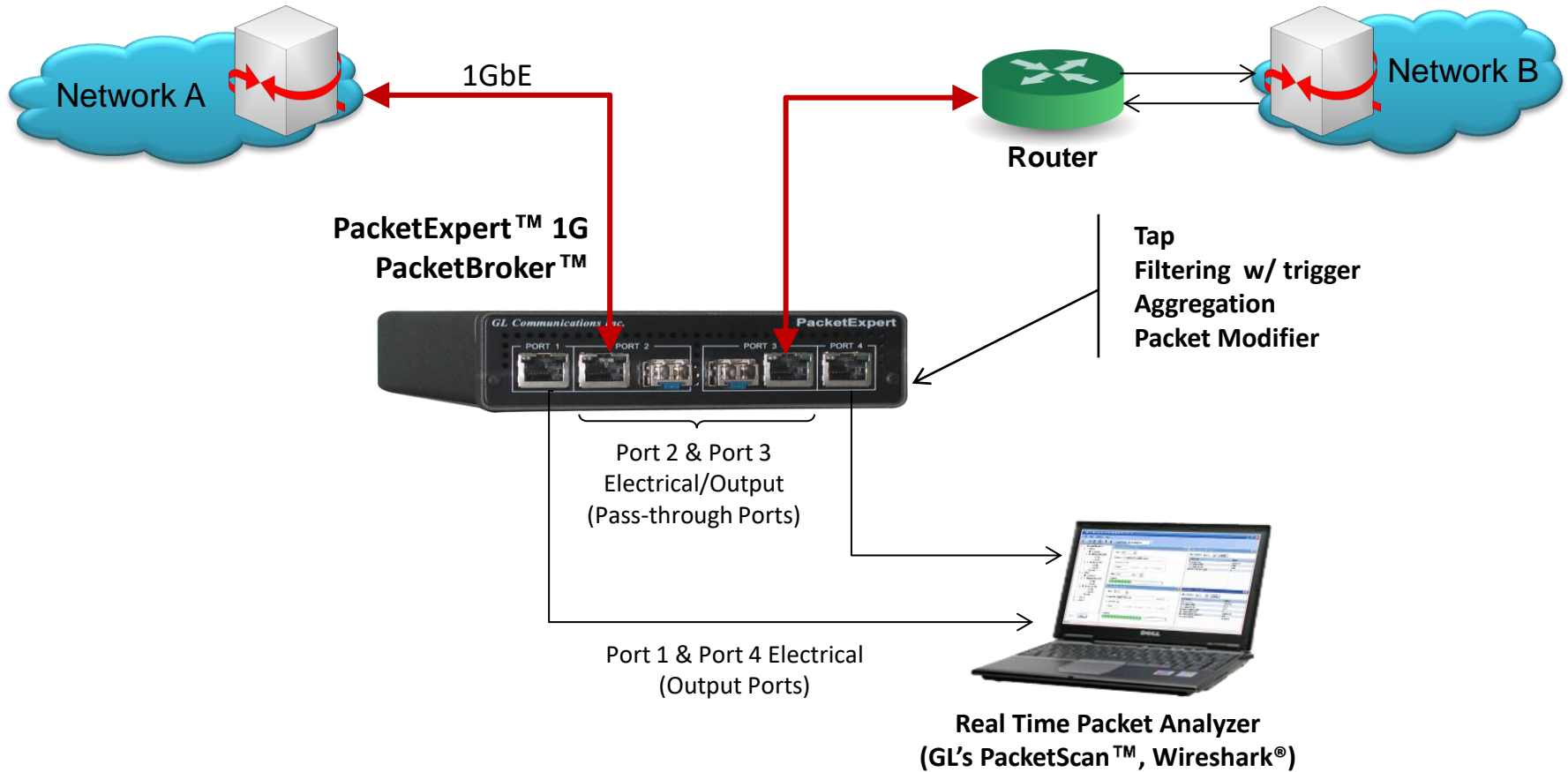
- Bit Error Rate Testing
- RFC 2544
- Smart Loopback Functionality
- ITU-T Y.1564 (verify service level agreements)
- Wirespeed Record/Playback Capability
- Multi-Stream Traffic Generator
- **PacketBroker**
- RFC 6349 (TCP Testing)

Active Network Tap

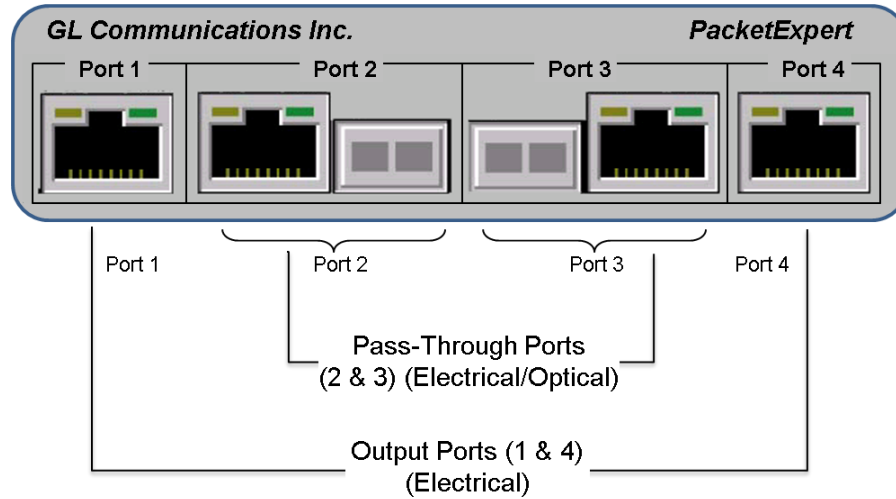


- Dedicated hardware device - FPGA based processing means full 100% wirespeed capability to pass through traffic no drops, no delays, and also to make two separate copies - Tx and Rx side
- Hardware filters means wirespeed filtering

PacketBroker™ in Network



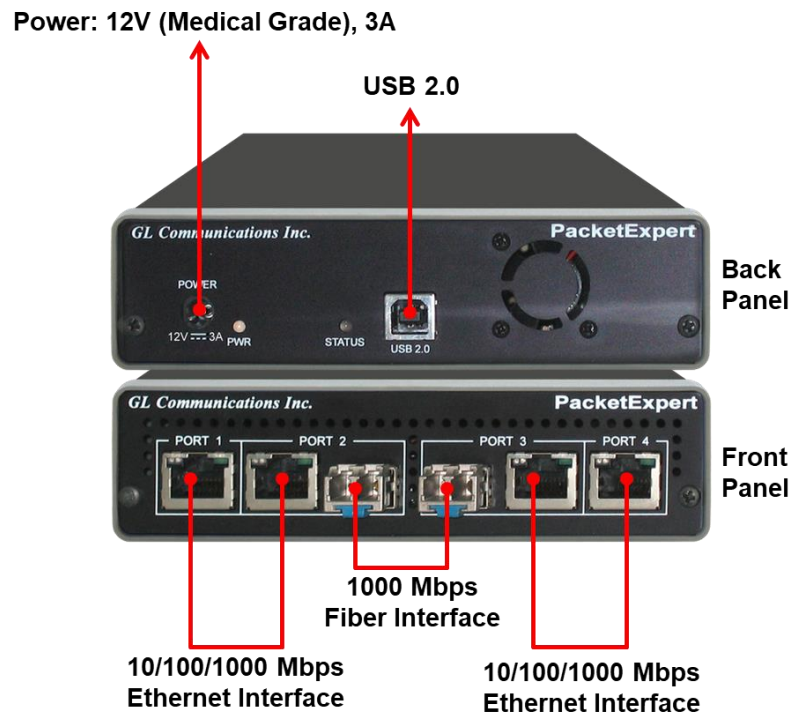
Features



- A network tap like application, with additional advanced features such as:
 - Active network tap - capable of handling bidirectional 100% wirespeed traffic upto 1 Gb/s
 - Wirespeed Filtering - powerful and easy to use
 - Packet Modification to convey useful information such as Timestamp inband
 - Output aggregation - both direction traffic multiplexed on the same output Based on PacketExpert™ hardware platform
- Ports 2 and 3 act as the Active/Pass through ports
- Ports 1 and 4 act as the Output ports

PacketExpert™ 1G Portable Unit

- 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
 - Optional 4-Port SMA Jack Trigger Board (TTL Input/Output)
- Protocols:
 - RFC 2544 compliance
 - ITU-T Y.1564 (ExpertSAM)
- Power:
 - +12 volts (Medical Grade), 3 Amps
- Bus Interface:
 - USB 2.0



PacketExpert™ mTOP™ Probe

Front Panel View



Rear Panel View



- Portable Quad Port Ethernet/VLAN/MPLS/IP/UDP Tester with 4 Electrical Ethernet Ports (10/100/1000 Mbps) and 2 Optical Ports (100/1000 Mbps). Embedded with Single Board Computer (SBC).
- **SBC Specs:** 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
- Each GigE port provides independent Ethernet/VLAN/MPLS/IP/UDP testing at wire speed for applications such as BERT, RFC 2544, and Loopback. BERT is implemented for all layers.
- RFC 2544 is applicable for Layers 2, 2.5, and 3, and Loopback is applicable for Layers 2, 3, and 4

PacketExpert™ High Density 12/24 GigE Ports mTOP™ Rack

PacketExpert™ SA (PXE112)



PacketExpert™ SA (PXE112) is a 12-Port PacketExpert™ w/ Embedded Single Board Computer (SBC).

SBC Specs: 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

19" 1U Rackmount Enclosure (If options, then x 3).

PacketExpert™ SA (PXE124)



PacketExpert™ SA (PXE124) is a 24-Port PacketExpert™ w/ Embedded Single Board Computer (SBC).

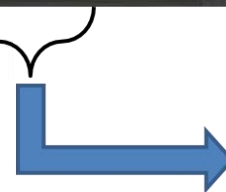
SBC Specs: Intel Core i3 or optional i7 NUC Equivalent, Windows® 11 64-bit Pro Operating System, USB 3.0 and USB 2.0 Ports, ATX Power Supply, USB Type C Ports, Ethernet 2.5GigE port, 256 GB Hard drive, 8G Memory (Min), Two HDMI ports

19" stacked 1U Rackmount Enclosure (If options, then x 6).

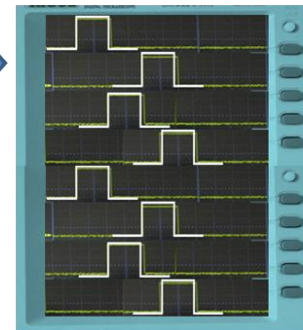
MTOP™ PacketBroker™ Rack Unit w/ 4 TTL Triggers



TTL Signals



Oscilloscope

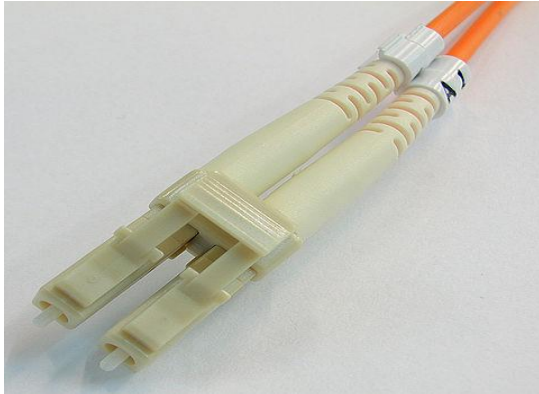


- PacketBroker™ can trigger pulses through TTL ports based on specified Ethernet traffic
- TTL pulses can be received on an oscilloscope for visual analysis of Ethernet traffic

Pulse generated on TTL I/O and is carried over SMA cable to the oscilloscope

Optical Connectors and SFP Transceivers

LC Connectors



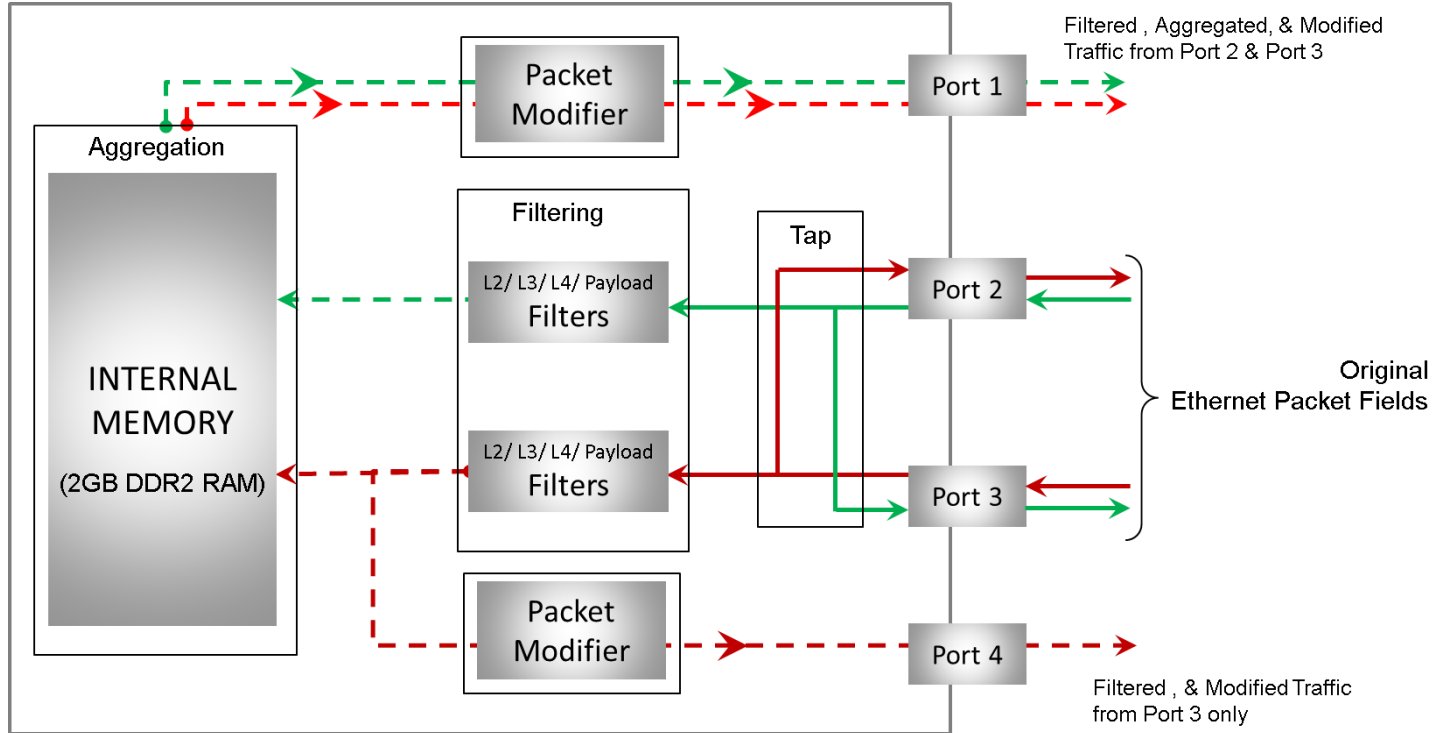
850/1310 nm SFP Module



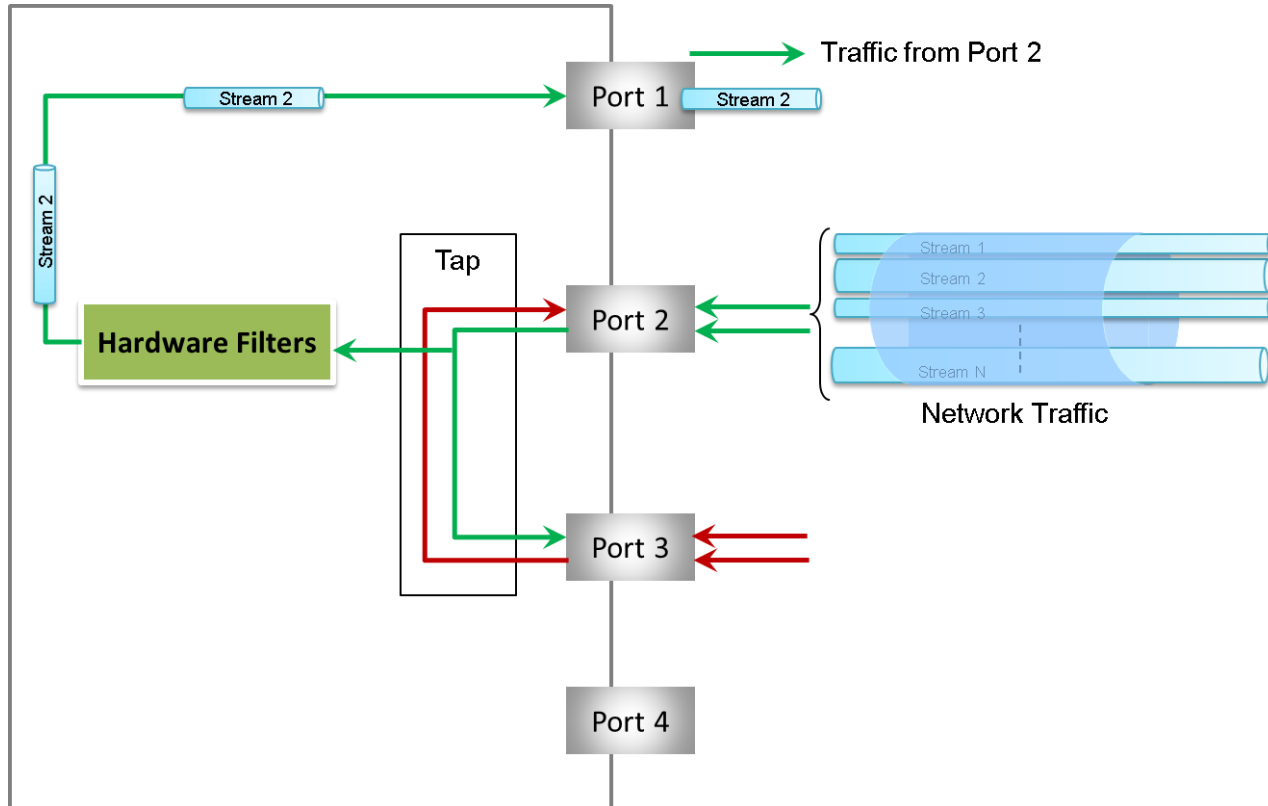
- PacketExpert™ supports LC connectors and 850/1310 nm Small Form-factor Pluggable (SFP) modules

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

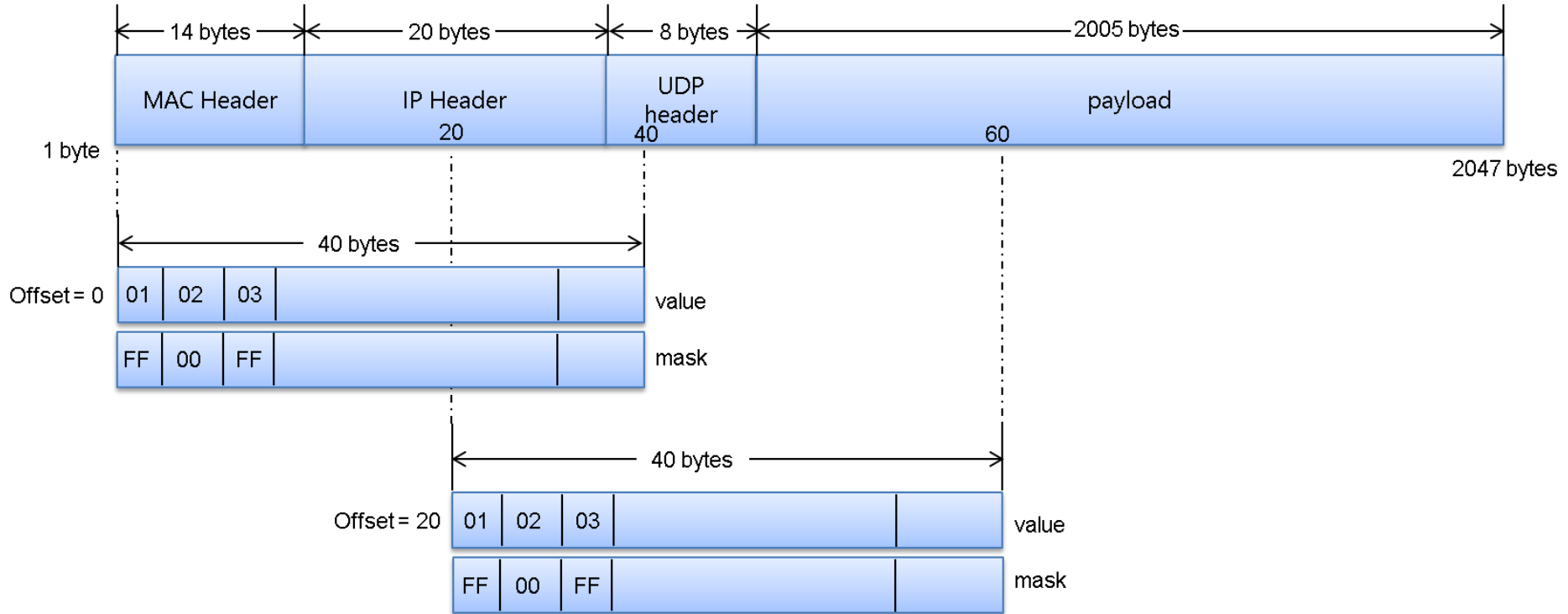
Packet Tap, Filter, Aggregation, Modification, and Output



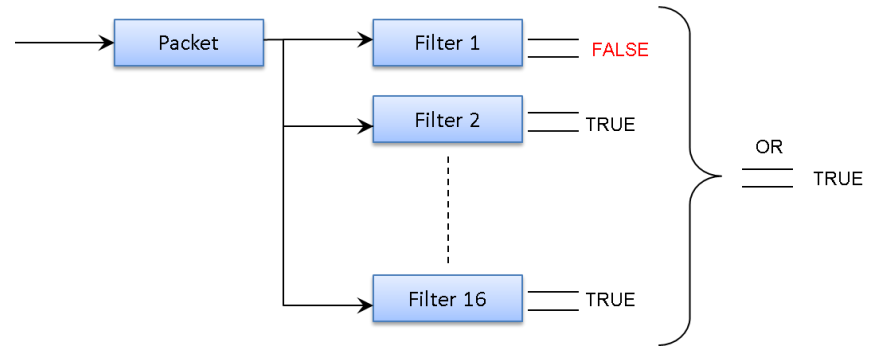
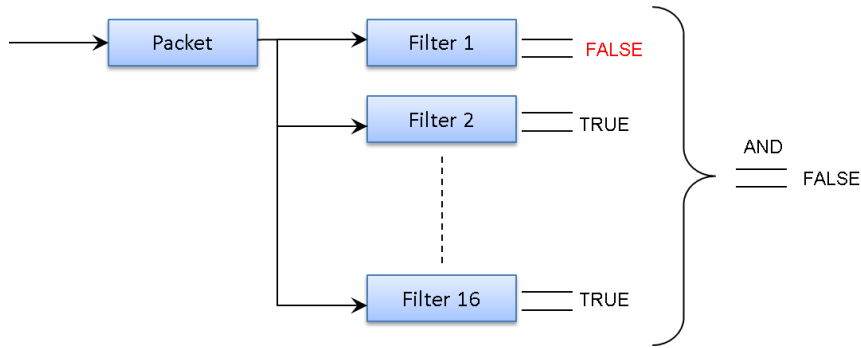
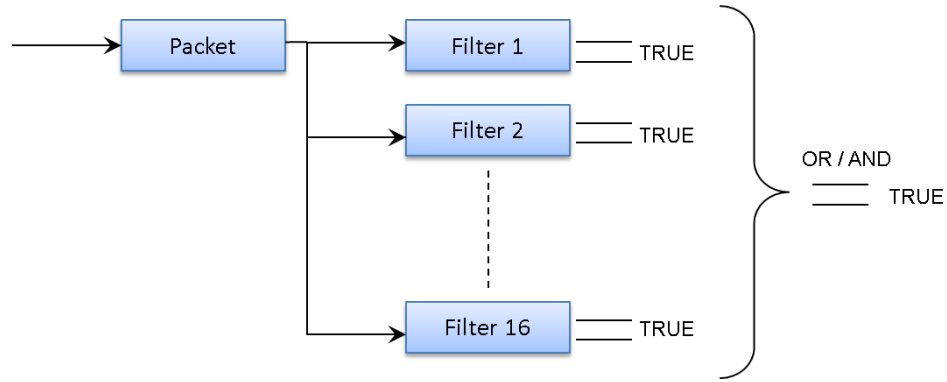
Capture Traffic of Interest



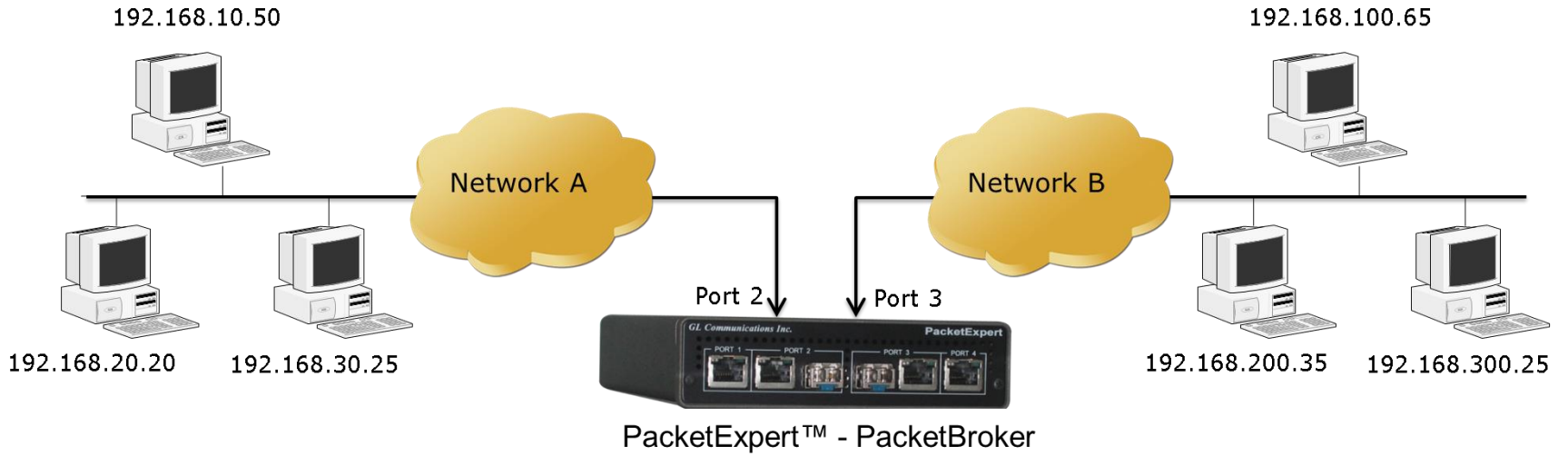
Header



Filter Combination



Filter Example



Filter Example (Contd.)

SIP and RTP between 192.168.10.50 192.168.300.25 unidirectional (192.168.10.50 --> 192.168.300.25)

Filter 1

SIP traffic between 192.168.10.50 and 192.168.200.35

(Ethernet Len/Type = 0x0800(IP) AND
Source IP address = 192.168.10.50 AND
Destination IP Address = 192.168.200.35 AND
IP Protocol = 17 (UDP)
Destination UDP port == 5060)

OR

Filter 2

RTP traffic between 192.168.10.50 and 192.168.200.35

(Ethernet Len/Type = 0x0800(IP) AND
Source IP address = 192.168.10.50 AND
Destination IP Address = 192.168.200.35 AND
IP Protocol = 17 (UDP)
Source UDP port = 1024 AND
Destination UDP port == 1024 AND
Payload first byte(43rd byte) == 0x80 (RTP valid version))

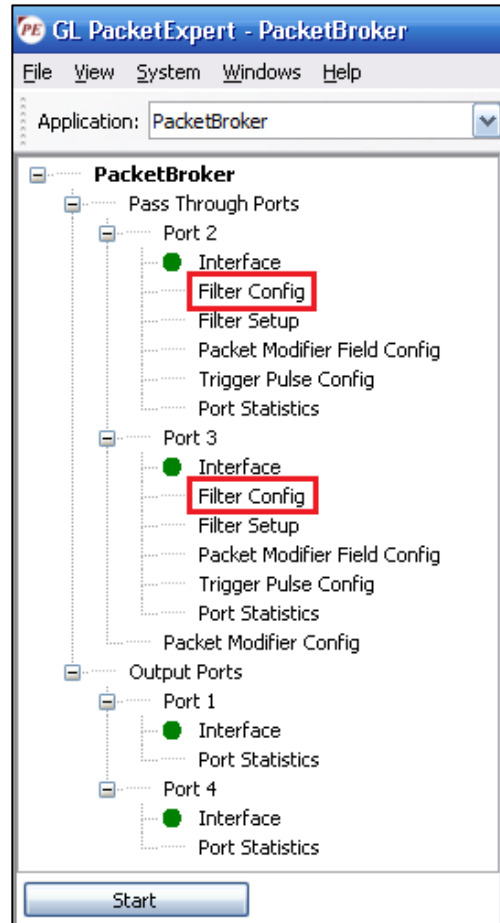
OR

Filter 3

RTP traffic between 192.168.10.50 and 192.168.200.35

(Ethernet Len/Type = 0x0800(IP) AND
Source IP address = 192.168.10.50 AND
Destination IP Address = 192.168.200.35 AND
IP Protocol = 17 (UDP)
Source UDP port = 1025 AND
Destination UDP port == 1025 AND
Payload first byte(43rd byte) == 0x80 (RTP valid version))

Filter Configuration Menu

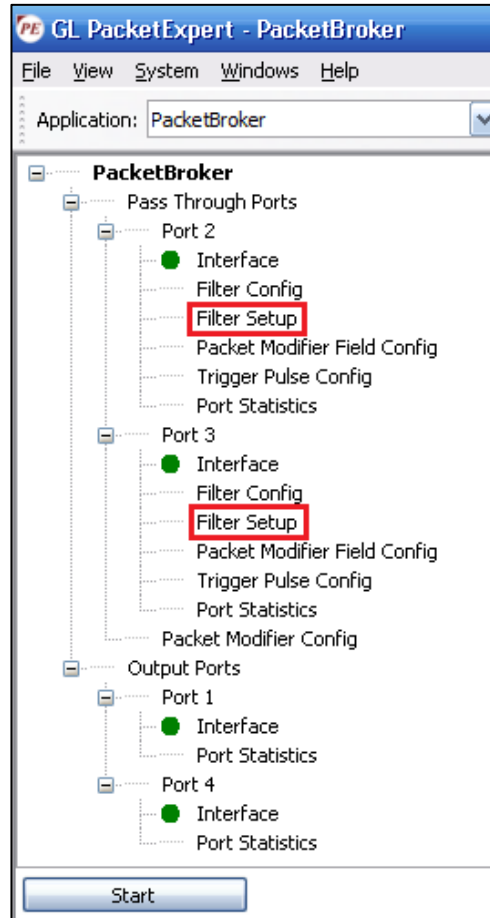


Filter Configuration Options

The screenshot shows the 'Filter Config' window with the following components:

- Port Selection:** Port 2
- Display Mode:** Raw
- Buttons:** Add, Delete, Copy (From 1 To 1)
- Table:** A table with columns: Filter No., Offset, Type, Bytes 0-7, Bytes 8-15, Bytes 16-23, Bytes 24-31, Bytes 32-39. A red box highlights the 'Offset' column and the first row of data.
- Annotations:**
 - 'Offset (0-2047)' points to the 'Offset' column.
 - '40 Bytes Raw Data /Mask Bytes' points to the data columns.
 - 'Raw Edit' points to the data columns.
 - 'Field Edit' points to the 'Fields' table below.
- Edit Section:** Filter No. 1, Offset 0, Dst MAC Address, Apply button.
- Layer Selection:** Layer 2: Ethernet, Layer 2.5: None, Layer 3: IP, Layer 4: UDP.
- Fields Table:** A table with columns: Field, Type, Data, Summary. It lists fields like Dst MAC Address, Src MAC Address, Ether Len/Type, IP Protocol, and Src IP Address.

Dynamically Enable/Disable Filters



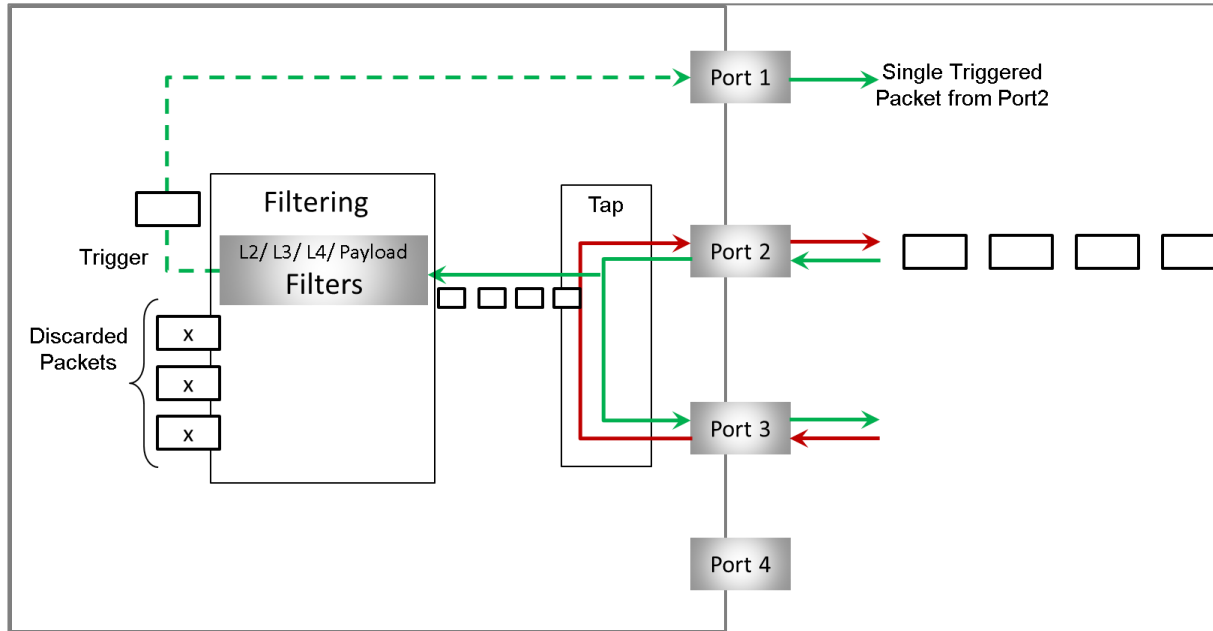
Dynamically Enable/Disable Filters

The screenshot shows the 'Filter Setup' window. It is divided into three main sections: 'In Ports', 'Aggregator', and 'Out Ports'.
- **In Ports:** Port 2 and Port 3, each with a 'Filters' dropdown.
- **Aggregator:** A 'Disabled' dropdown and an 'Output' dropdown set to '1'.
- **Out Ports:** Port 1 and Port 4, each with a 'Packet Modifier' dropdown set to 'Enabled' and an 'Output' dropdown set to 'Enabled'.
Below these sections are controls for 'Port Selection' (set to 'Port 2'), 'Reset', 'Activate All', 'Deactivate All', and 'Operation' (set to 'OR').
A 'Filter Summary' box lists filters F1 through F16.
At the bottom is a table with columns: Filter No, NOT, Filter Mode, Triggered/Filtered P..., Triggered Status, and Trigger.

Filter No	NOT	Filter Mode	Triggered/Filtered P...	Triggered Status	Trigger
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Continuous	9651		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continuous	0		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continuous	0		

Dynamically Enable/Disable Filters, even at run-time

Trigger Mode



- PacketBroker™ helps achieve this using the Trigger mode for filters
- In this user can start the filter in Trigger mode, where it starts to look for packet matching the user defined value
- As soon as the first packet matches the filter, the filter is set to be triggered, and stops further capture

Trigger Mode

Filter Setup

Port Selection: Port 2 [Reset] [Activate All] [Deactivate All]

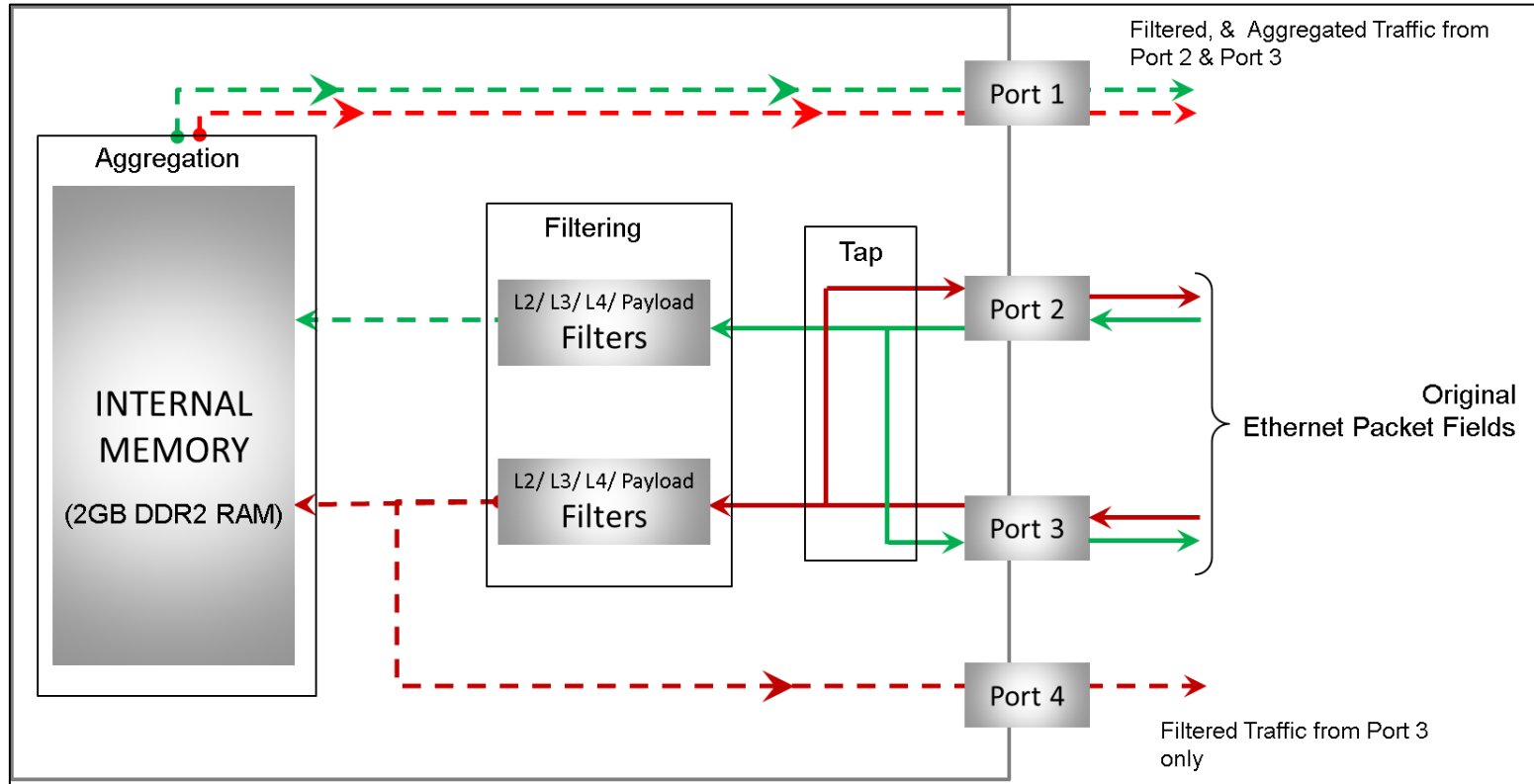
Filter No	Filter Mode	Triggered/Filtered Packets	Triggered Status	Trigger	
<input checked="" type="checkbox"/>	1	Continuous	4382		
<input checked="" type="checkbox"/>	2	Mono Trigger	0	● Waiting	Set

Filter Setup

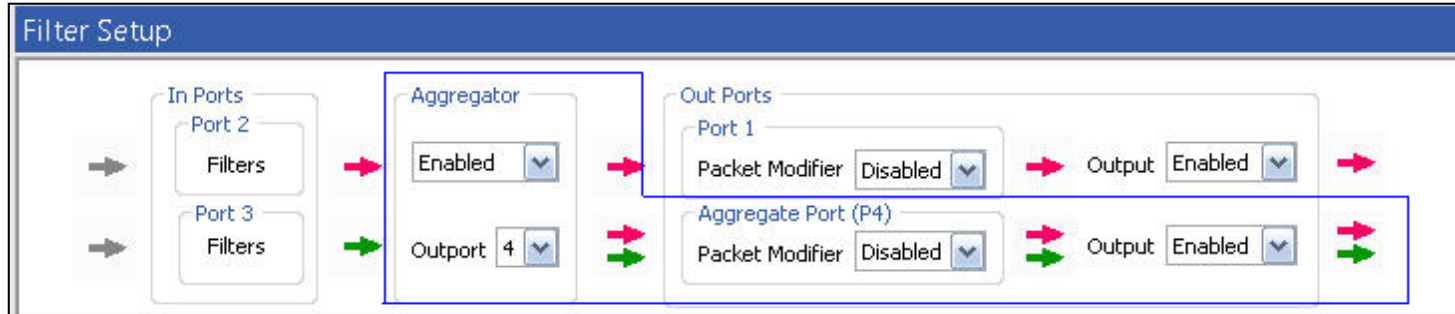
Port Selection: Port 2 [Reset] [Activate All] [Deactivate All]

Filter No	Filter Mode	Triggered/Filtered Packets	Triggered Status	Trigger	
<input checked="" type="checkbox"/>	1	Mono Trigger	2	✓ Triggered	Set
<input checked="" type="checkbox"/>	2	Mono Trigger	3	✓ Triggered	Set
<input checked="" type="checkbox"/>	3	Mono Trigger	3	✓ Triggered	Set
<input checked="" type="checkbox"/>	4	Mono Trigger	1	✓ Triggered	Set

Packet Aggregation (Contd.)

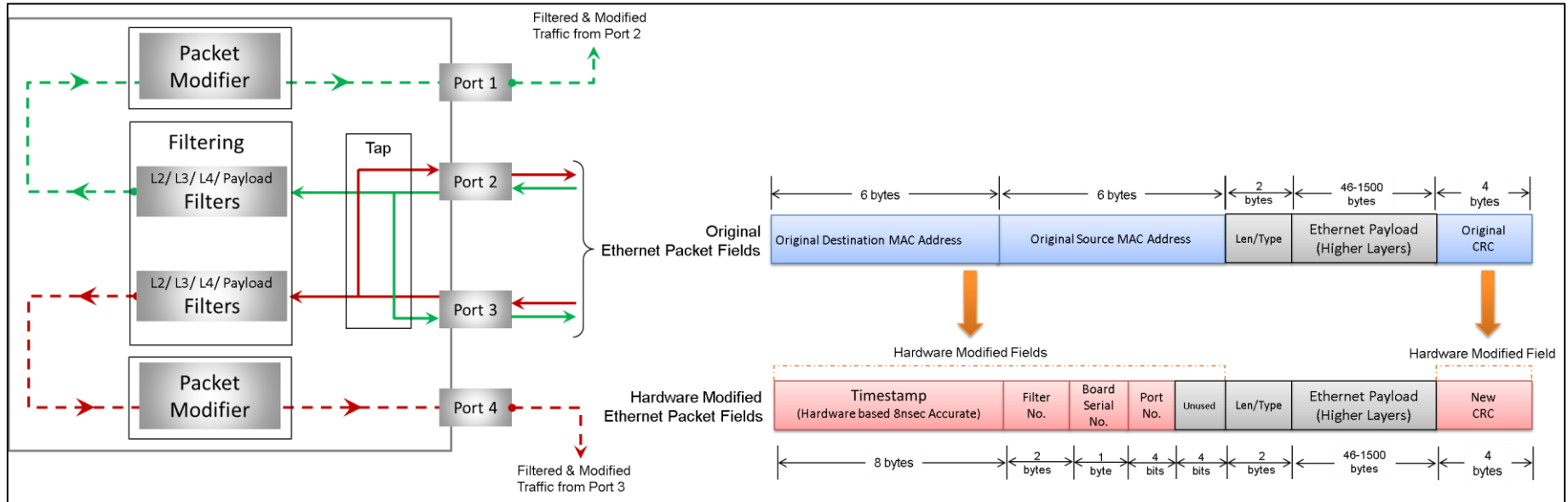


Packet Aggregation User Interface



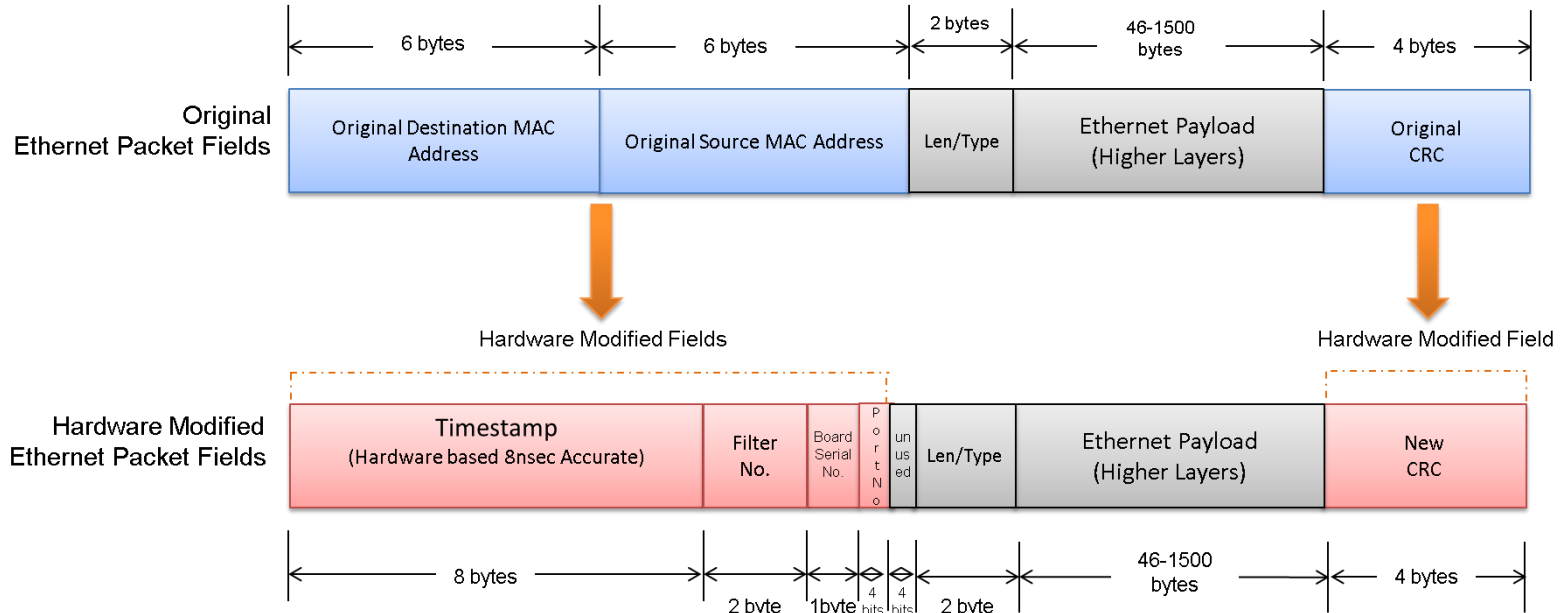
- The filtered traffic is combined and sent out through a single output port
- If the combined bandwidth exceeds the wirespeed of the output port, may cause packet loss
- Hence, the onboard memory (2 GB DR2 RAM) is used as a temporary buffer to store the traffic before sent out at wirespeed. Thus, upto 2 GB of traffic can be buffered

Packet Modification



- Need to convey very useful information such as the timestamp, port number, filter number etc. to the analysis tool
- May not have the flexibility to convey it outband – may need to do it inband
- PacketBroker™ provides this functionality by conveying it in the MAC header of the output packets

Packet Modification



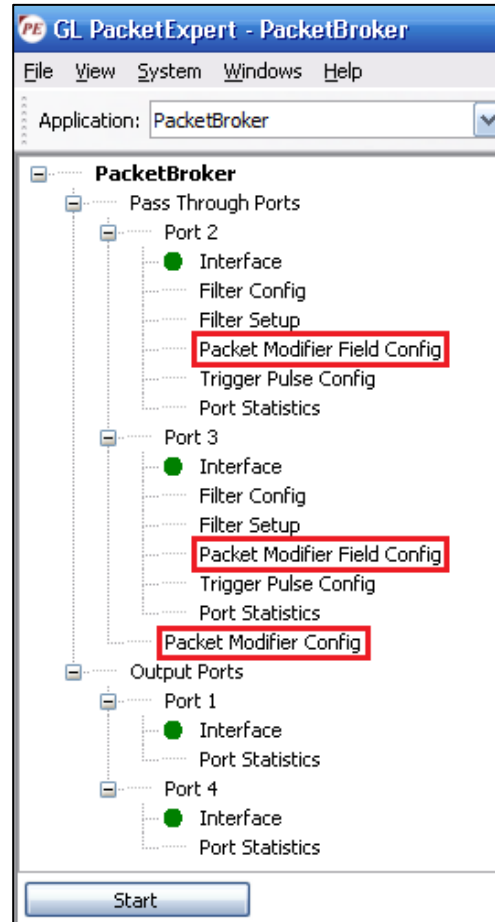
- Timestamp, Filter Number, Board Serial Number and Port Number fields are written on top of the Src MAC address and Dst MAC Address fields
- Ethernet CRC is recalculated
- Original MAC header will be lost, but many times, this may be fine if interest is only in higher layers (IP, TCP/UDP etc.)

Packet Modifier Enable/Disable

Filter Setup

The screenshot displays the 'Filter Setup' configuration window. It is organized into three main sections: 'In Ports', 'Aggregator', and 'Out Ports'.
- **In Ports:** Contains two sub-sections, 'Port 2' and 'Port 3', each with a 'Filters' button. A 'Port Selection' dropdown is set to 'Port 2'.
- **Aggregator:** Features a 'Enabled' dropdown menu and an 'Outport' dropdown menu set to '4'.
- **Out Ports:** Contains two sub-sections, 'Port 1' and 'Aggregate Port (P4)'. Each has a 'Packet Modifier' dropdown and an 'Output' dropdown. The 'Packet Modifier' for 'Port 1' is highlighted with a red box and is set to 'Disabled'. The 'Output' for 'Port 1' is 'Disabled'. The 'Aggregate Port (P4)' has a 'Packet Modifier' set to 'Enabled' and an 'Output' set to 'Disabled'.
At the bottom, there is a 'Reset' button, and two buttons labeled 'Activate All' and 'Deactivate All'.

Packet Modifier Field Config Menu



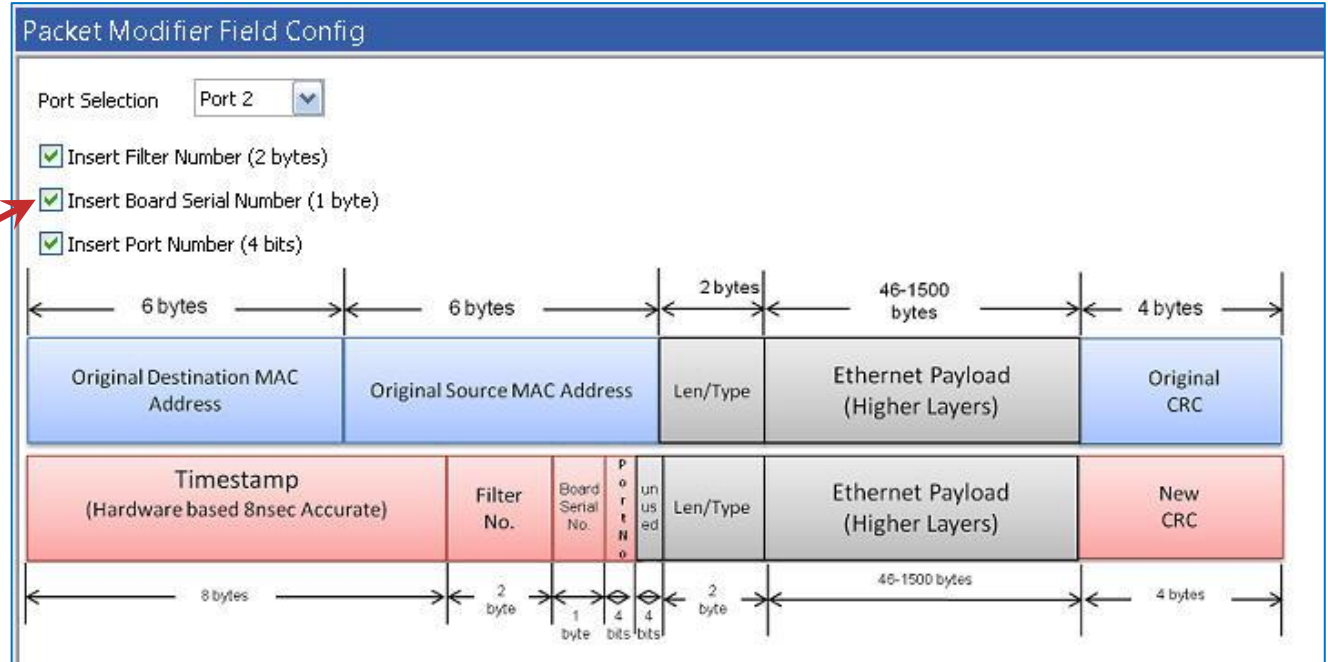
Packet Modifier Field Configuration

Packet Modifier Config

Board Serial No

Take From Hardware

User Configured (0-255)



Packet Modifier Board Serial Number Config UI

Packet Modifier Config

Board Serial No

Take From Hardware

User Configured (0-255)

Device Information

Number Of Devices: 1

Name	Serial Number	Model Number	USB Type	DDR Module Part Number
Device1	177470	3.0	USB 2.0	-

MAC Addresses

Port #1	Port #2	Port #3	Port #4
00-21-C2-00-09-B0	00-21-C2-00-09-B1	00-21-C2-00-09-B2	00-21-C2-00-09-B3

10G License

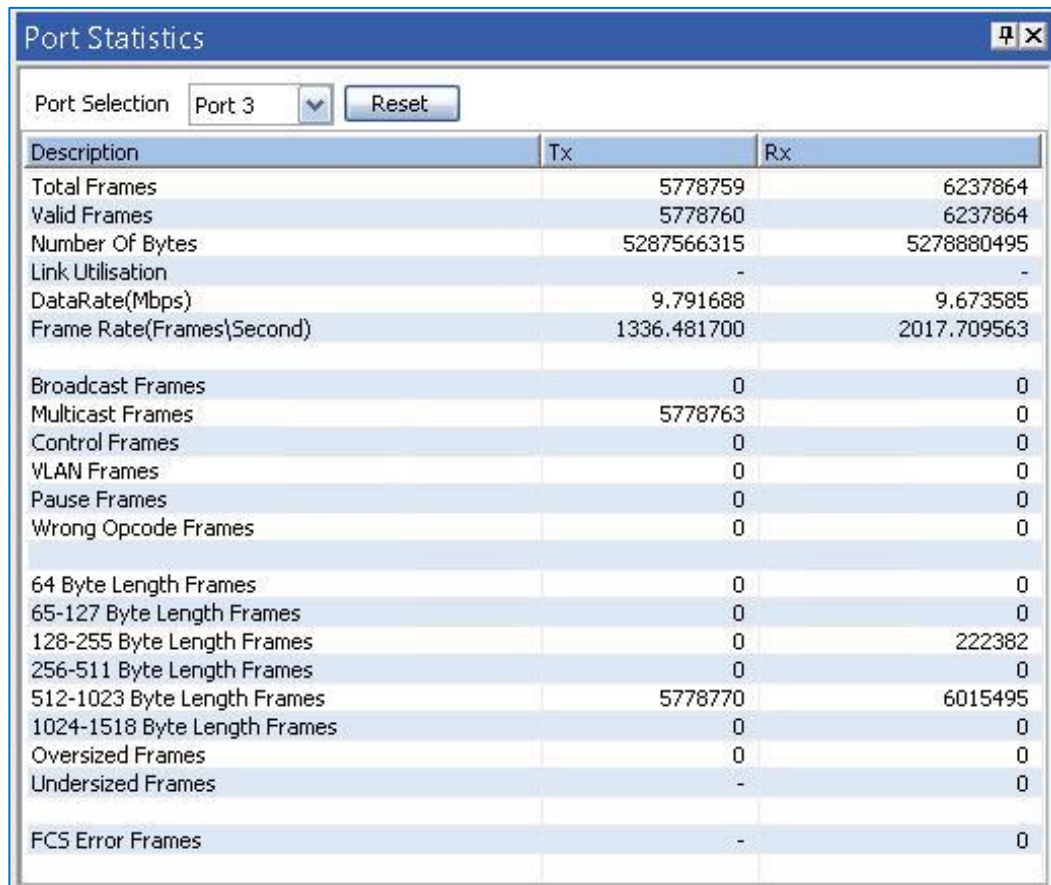
Description	Part#	License Type	Licensed Status
-NA-	-NA-	-NA-	-NA-

License Details

Application Name	Part#	License Type	Licensed Status
All Port Bert	PXE100	Basic	-NA-
RFC 2544	PXE100	Basic	-NA-
RFC 2544 (Single Port)	PXE100	Basic	-NA-
All Port Loopback	PXE100	Basic	-NA-
Bert/Loopback	PXE100	Basic	-NA-
Record Only	PXE105	Optional License	✓
PacketBroker	PXE107	Optional License	✓
Playback Only	PXE105	Optional License	✓
Record And Playback	PXE105	Optional License	✓
ExpertSAM	PXE106	Optional License	✓
ExpertTCP	PXE108	Optional License	✓
Multi-Stream Traffic Generator & Analyzer	PXE108	Optional License	✓

OK

Port Statistics



The screenshot shows a 'Port Statistics' window with a title bar containing a maximize icon and a close button. Below the title bar, there is a 'Port Selection' dropdown menu set to 'Port 3' and a 'Reset' button. The main area contains a table with three columns: 'Description', 'Tx', and 'Rx'. The table lists various network statistics such as Total Frames, Valid Frames, Number Of Bytes, Link Utilisation, DataRate(Mbps), Frame Rate(Frames\Second), and several categories of frames (Broadcast, Multicast, Control, VLAN, Pause, Wrong Opcode, 64-1518 Byte Length, Oversized, Undersized, and FCS Error).

Description	Tx	Rx
Total Frames	5778759	6237864
Valid Frames	5778760	6237864
Number Of Bytes	5287566315	5278880495
Link Utilisation	-	-
DataRate(Mbps)	9.791688	9.673585
Frame Rate(Frames\Second)	1336.481700	2017.709563
Broadcast Frames	0	0
Multicast Frames	5778763	0
Control Frames	0	0
VLAN Frames	0	0
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	0	222382
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	5778770	6015495
1024-1518 Byte Length Frames	0	0
Oversized Frames	0	0
Undersized Frames	-	0
FCS Error Frames	-	0

Thank you