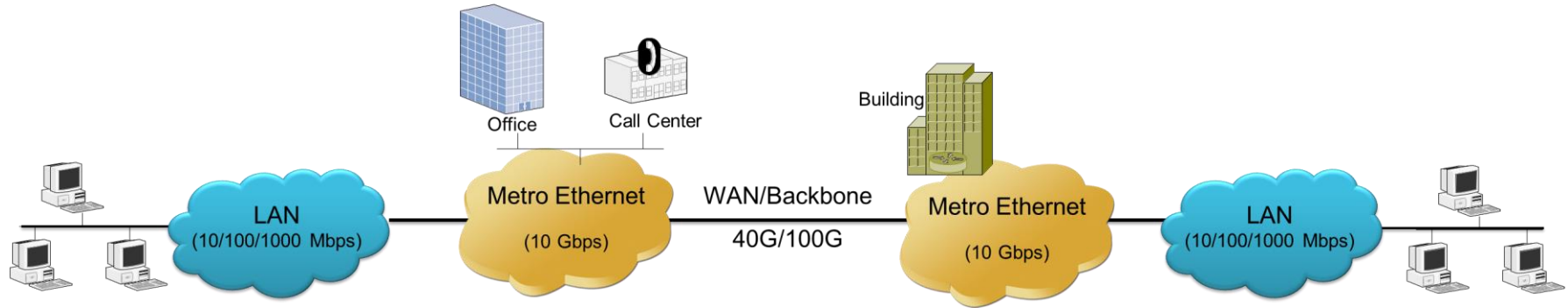

PacketExpert™ 10GX – PacketBroker™

(Wire-speed Ethernet Tap)



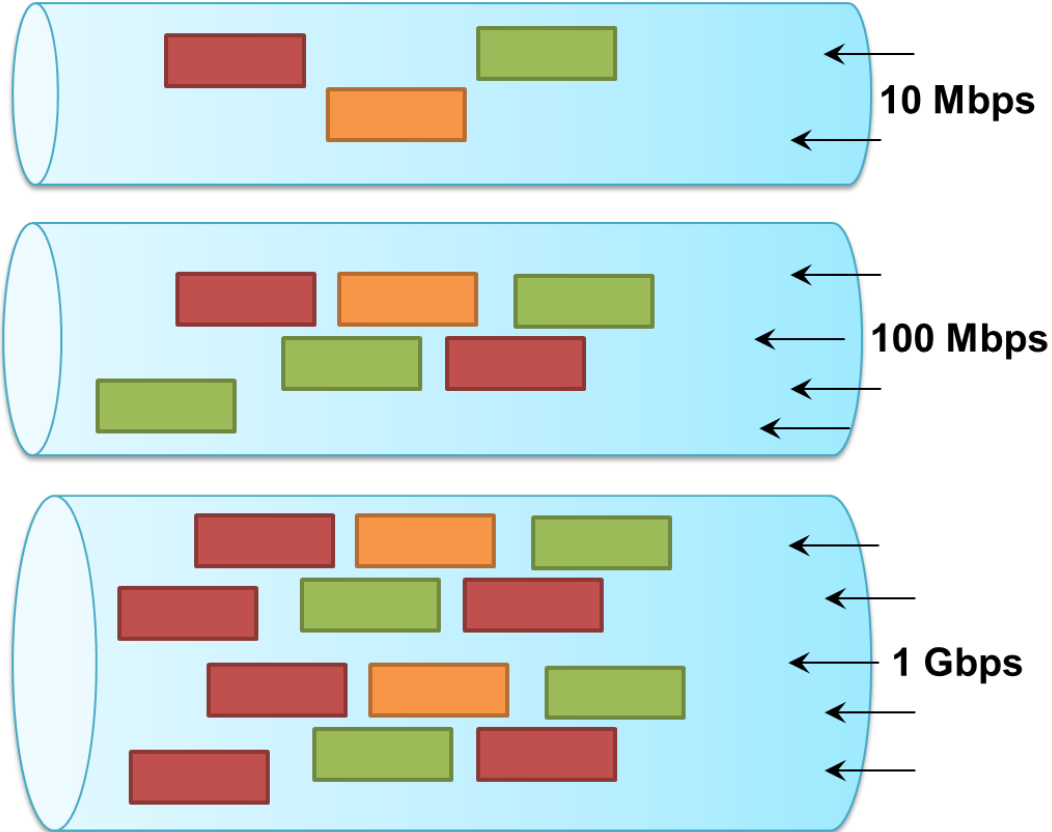
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <https://www.gl.com>

Ethernet Technology

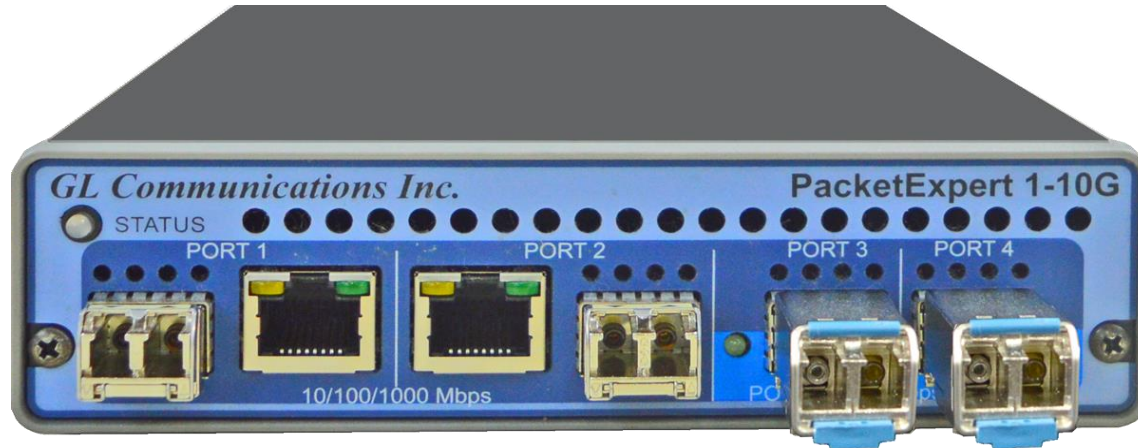


- Ethernet has become ubiquitous in both Local Area Networks and Wide Area Networks
- Network engineers require the ability to capture the traffic at different locations in the network

Just bigger Pipes, but same Ethernet Packets



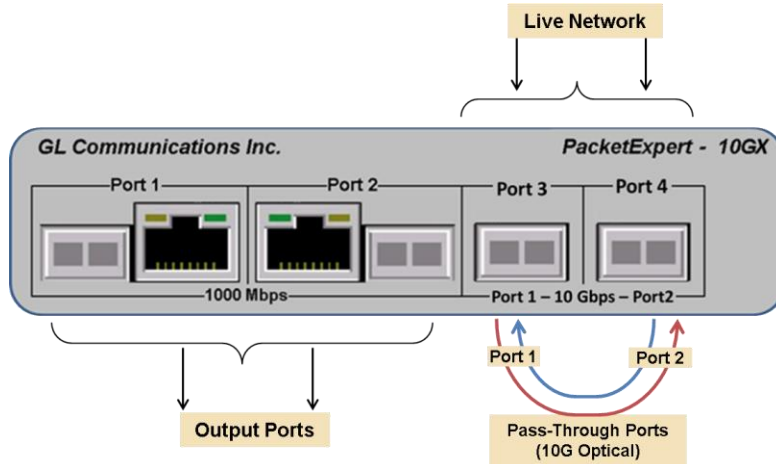
PacketExpert™ 10GX (10G/2.5G/1G)



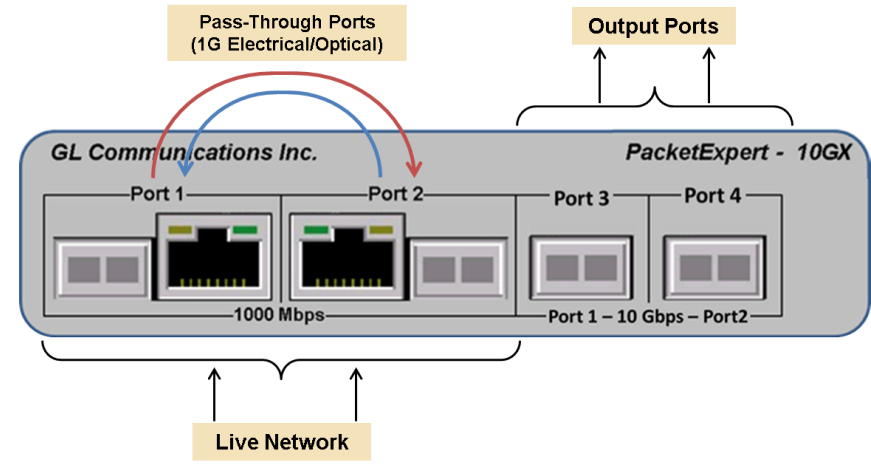
- Bit Error Rate Testing
- RFC 2544
- Smart Loopback Functionality
- ITU-T Y.1564 (Verify service level agreements)
- Wirespeed Record/Playback Capability
- Multi-Stream Traffic Generator
- PacketBroker
- RFC 6349 (TCP Testing)
- IP Wide Area Network Emulation

Active Network Tap

For 1G Ports

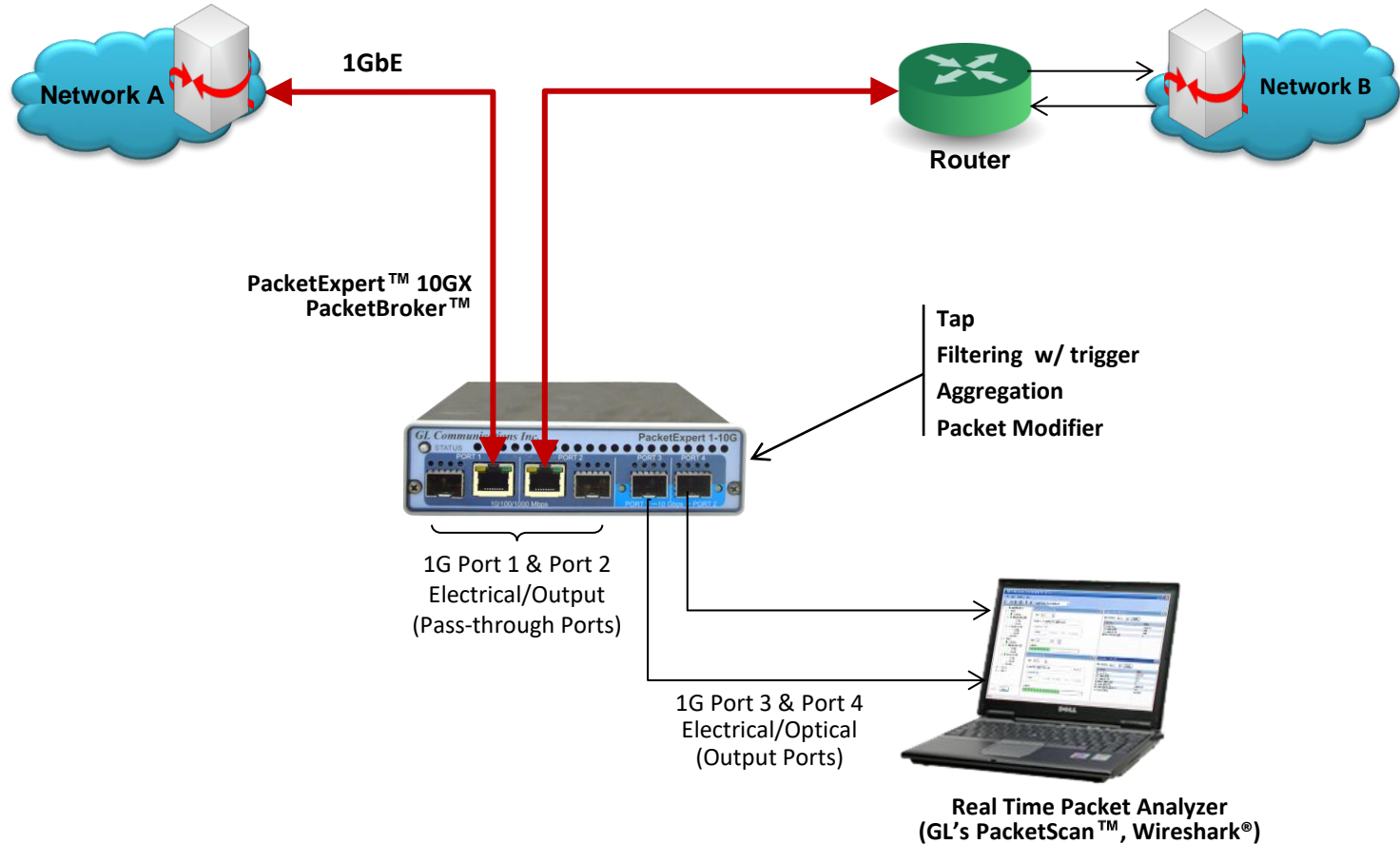


For 10G Ports

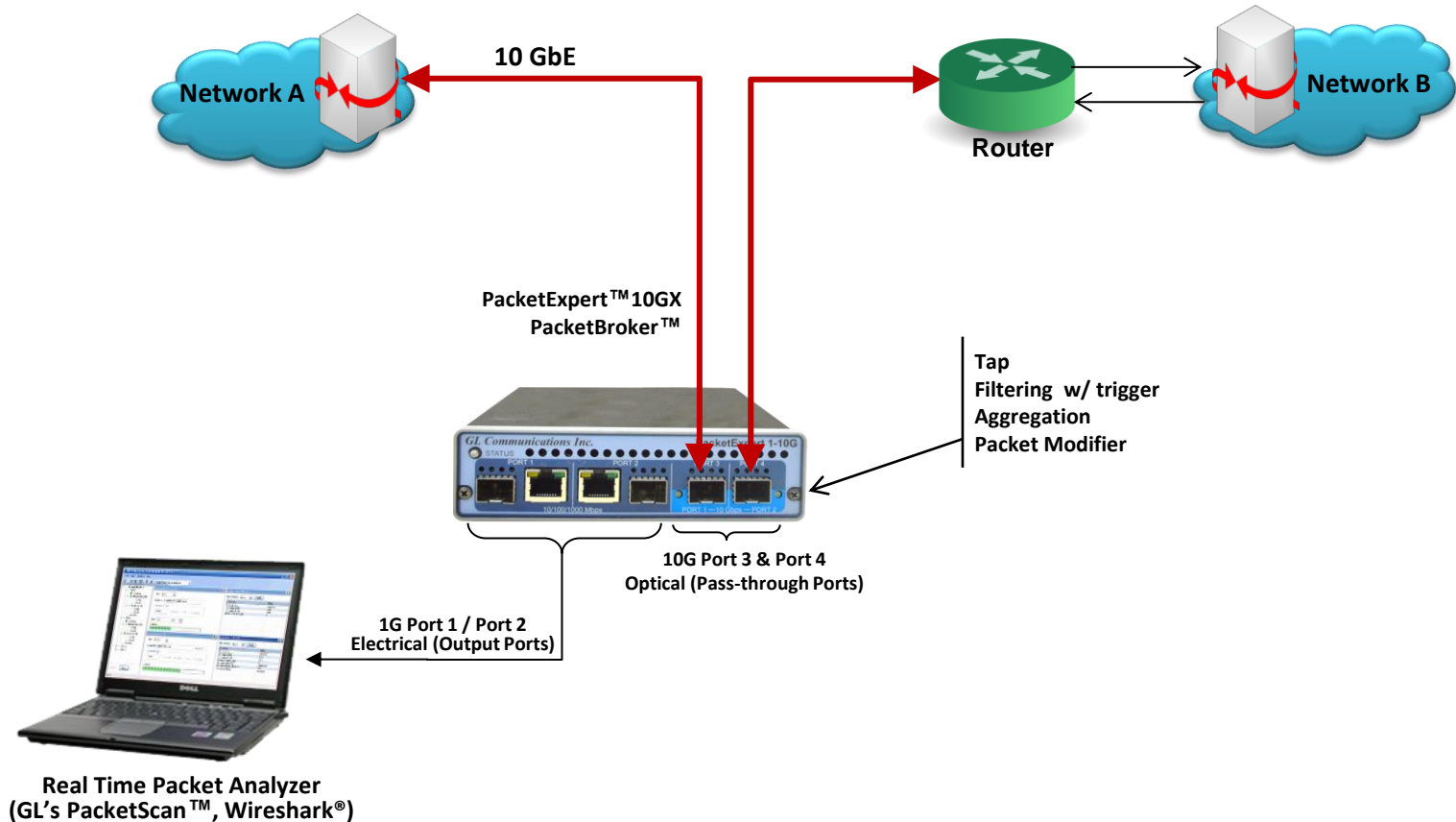


- Dedicated hardware device - FPGA based processing means full 100% wirespeed capability to pass through traffic no drops, no delays, and also to make two separate copies - Tx and Rx side
- Hardware filters means wirespeed filtering

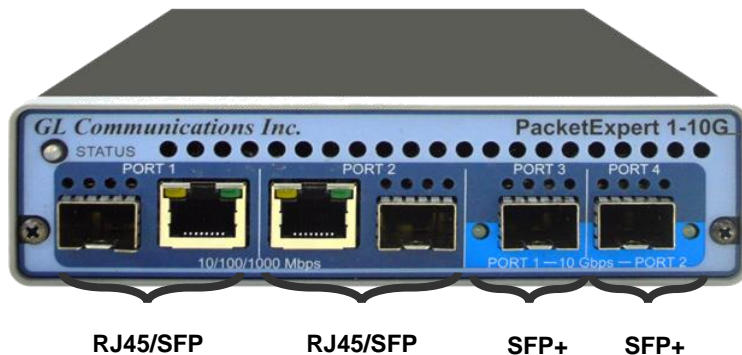
PacketBroker™ in Network (1GbE)



PacketBroker™ in Network (10GbE)



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

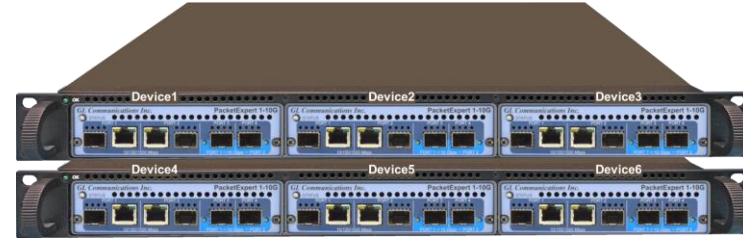


Physical Specifications	<ul style="list-style-type: none">Length: 8.45 in (214.63 mm)Width: 5.55 in (140.97 mm)Height: 1.60 in (40.64 mm)Weight: 1.713 lbs
External Power Supply	<ul style="list-style-type: none">+12 Volts (Medical Grade), 3 Amps (For portable units having serial number ≥ 188400)+9 Volts, 2 Amps (For portable units having serial number ≥ 188400)
BUS Interface	<ul style="list-style-type: none">USB 3.0Optional 4-Port SMA Jack Trigger Board(TTL Input/Output)
Protocols	<ul style="list-style-type: none">IEEE 802.3ae LAN PHY complianceRFC 2544 compliance

MTOP™ Rack Units



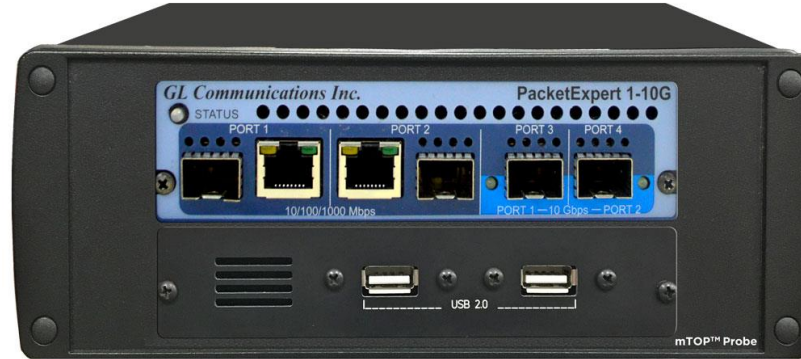
High Density 1U Rack option



Stacked High Density 1U Rack option

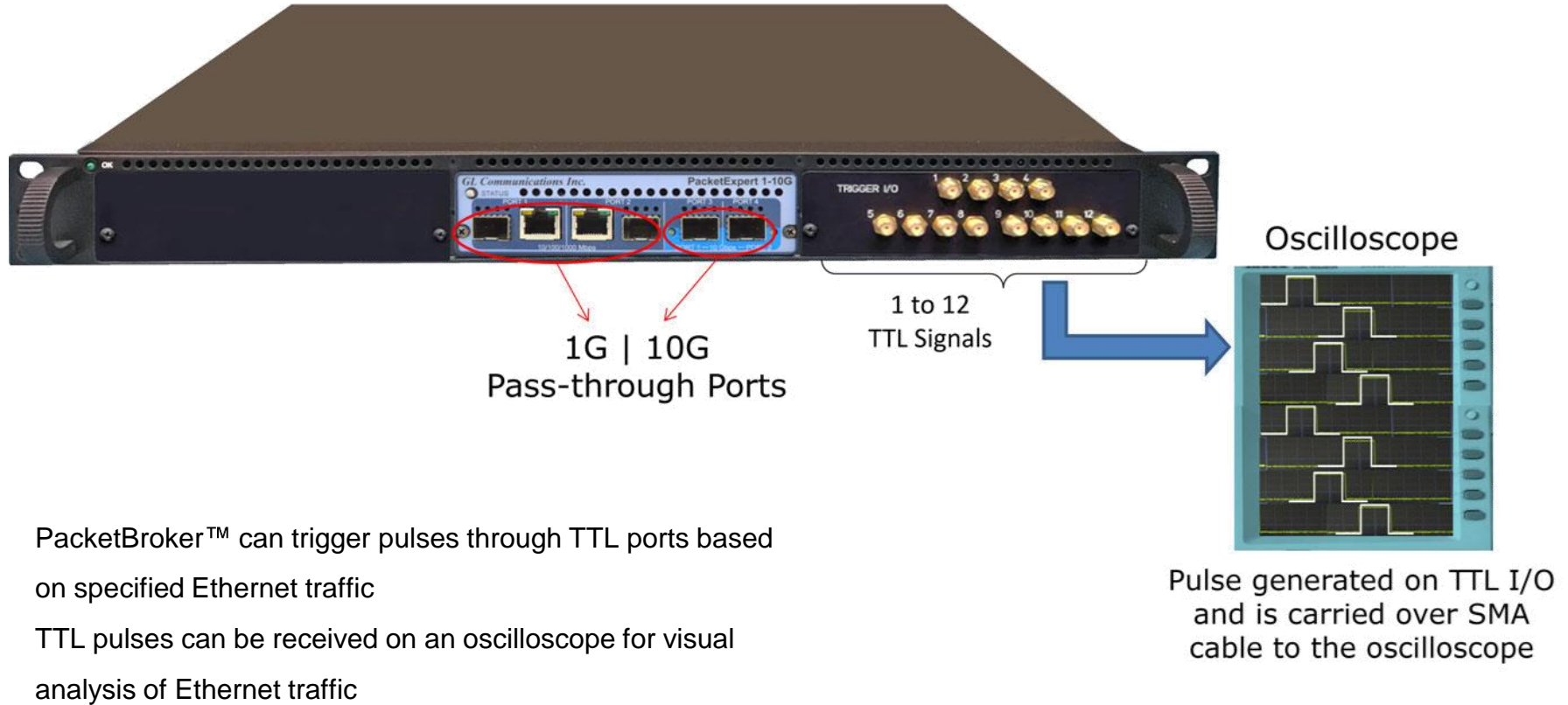
Physical Specifications	<ul style="list-style-type: none">Length: 16 in (406.4)Width: 19 in (482.6)Height: 1U / 2U
External Power Supply	<ul style="list-style-type: none">ATX Power Supply
BUS Interface	<ul style="list-style-type: none">1U mTOP™ (MT001 + 3x PXN100)<ul style="list-style-type: none">➤ Rackmount Enclosure can support up to 3 PXN100s2U Rack Mount (with 6x PXN100)<ul style="list-style-type: none">➤ Rackmount Enclosure can support up to 6 PXN100sOptional 4 to 12 Port SMA Jack Trigger Board (TTL Input/Output)
SBC Specifications	<ul style="list-style-type: none">Intel Core i3 or optional i7 NUC EquivalentWindows® 11 64-bit Pro Operating SystemUSB 3.0 and USB 2.0 PortsUSB Type C Ports, Ethernet 2.5GigE port256 GB Hard drive, 8G Memory (Min)Two HDMI ports

mTOP™ Probe with 10GX Hardware Unit + SBC

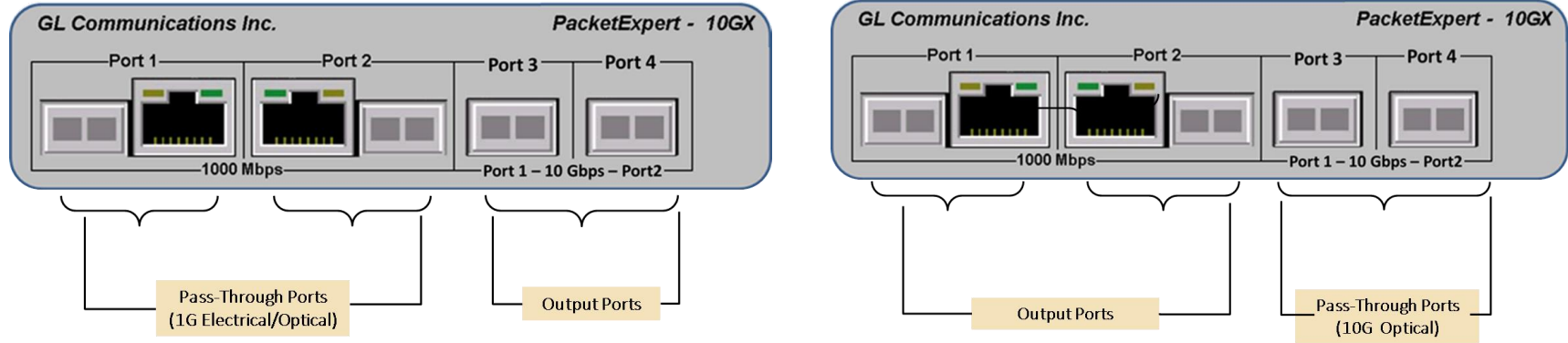


Physical Specifications	<ul style="list-style-type: none">• Length: 10.4 in. (264.16 mm)• Width: 8.4 in. (213.36 mm)• Height: 3.0 in. (76.2 mm)• Optional 4-Port SMA Jack Trigger Board (TTL Input/Output)• External USB based Wi-Fi adaptor
External Power Supply	<ul style="list-style-type: none">• +12 Volts (Medical Grade), 3 Amps
SBC Specifications	<ul style="list-style-type: none">• 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

MTOP™ PacketBroker™ Rack Unit w/ 12 TTL Triggers

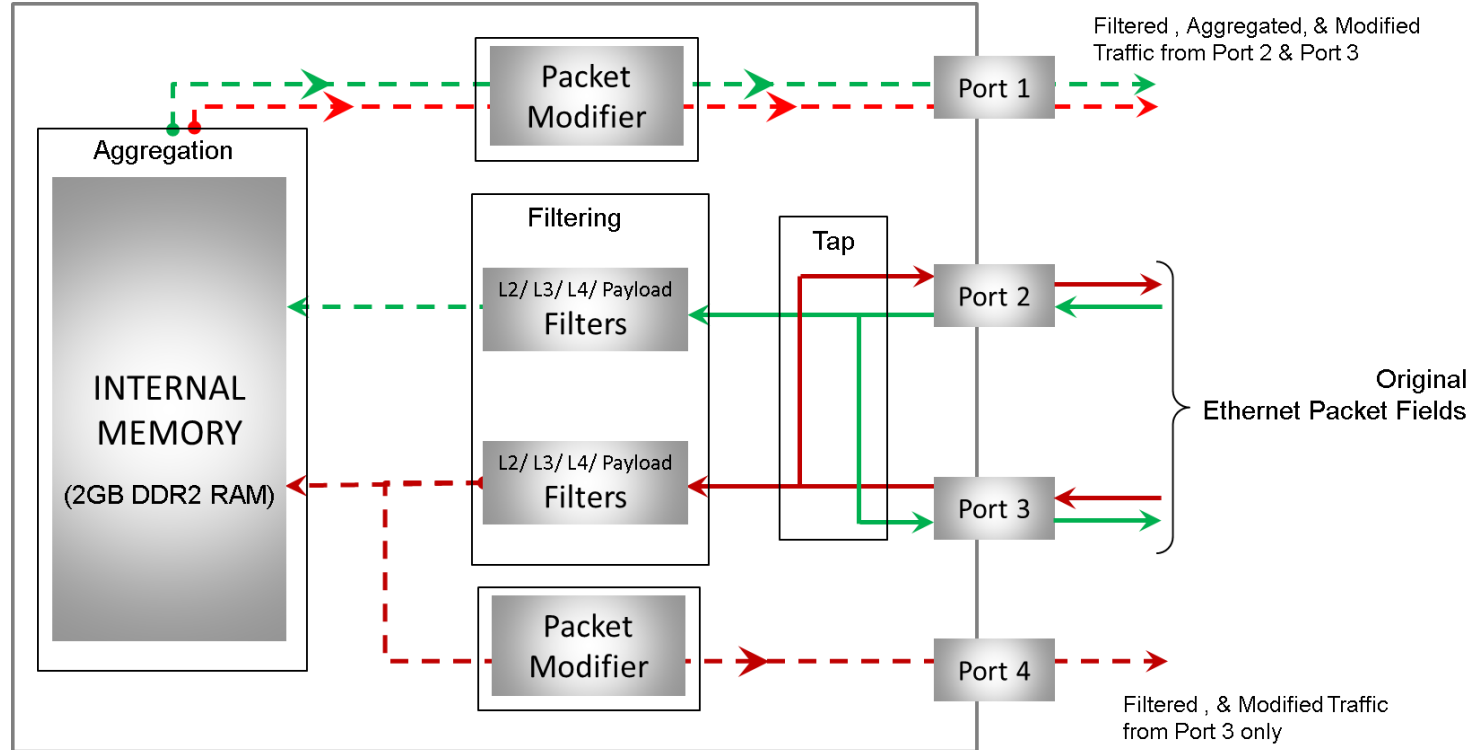


Features

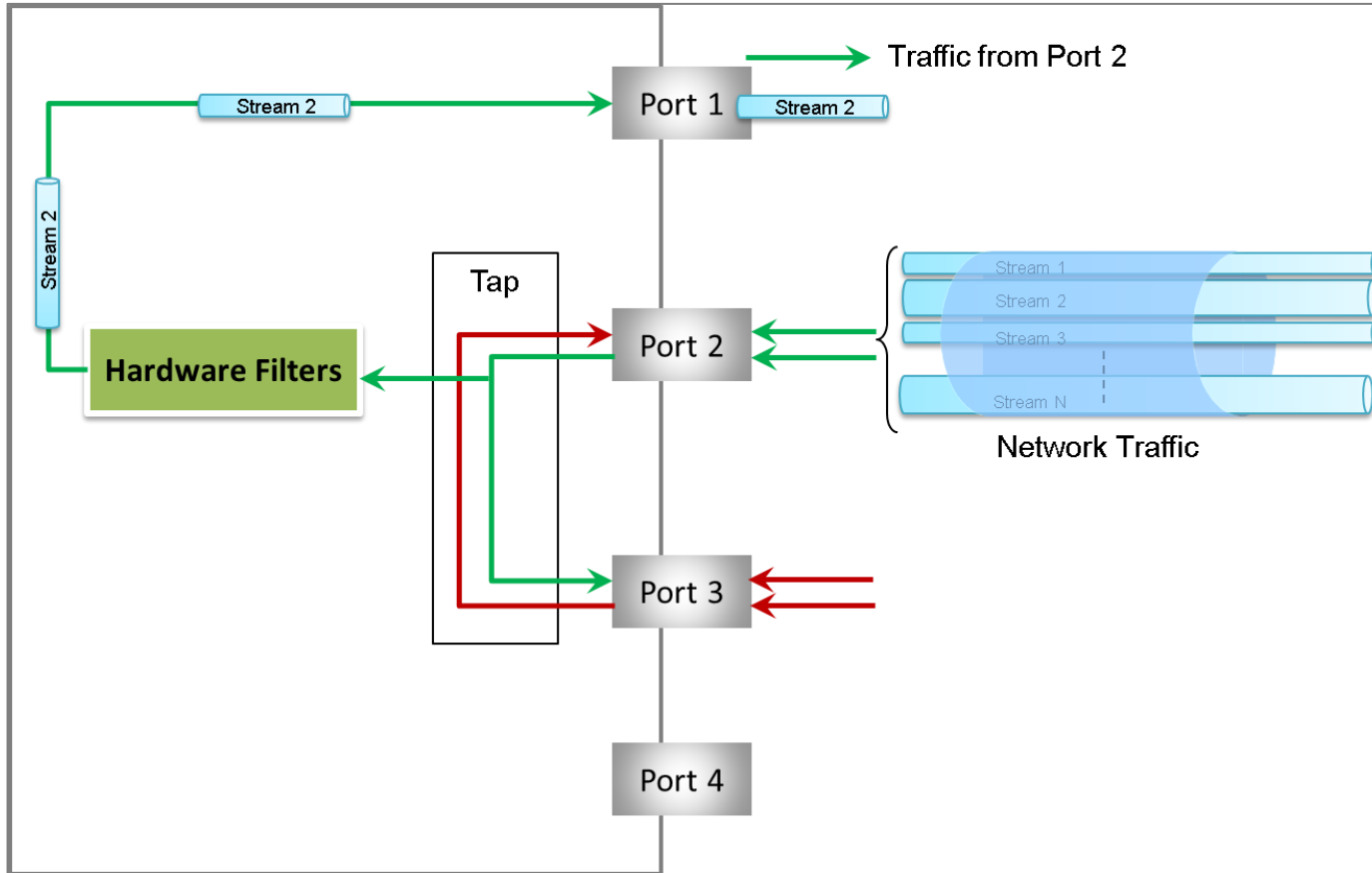


- A network tap like application, with additional advanced features like
 - Active network tap - capable of handling bidirectional 100% wirespeed traffic upto 1 Gb/s
 - Wirespeed Filtering - powerful and easy to use
 - Packet Modification to convey useful information like Timestamp inband
 - Output aggregation - both direction traffic multiplexed on the same output Based on PacketExpert™ 10GX hardware platform
- It has two 10/2.5/1 Gbps Optical/Electrical ports, and two 10/100/1000 Mbps Electrical ports or 100/1000 Mbps Optical ports. The 10 Gbps ports can be down-shifted to support 1Gbps Electrical ports, thus offering 4 Electrical/Optical 1 Gbps ports

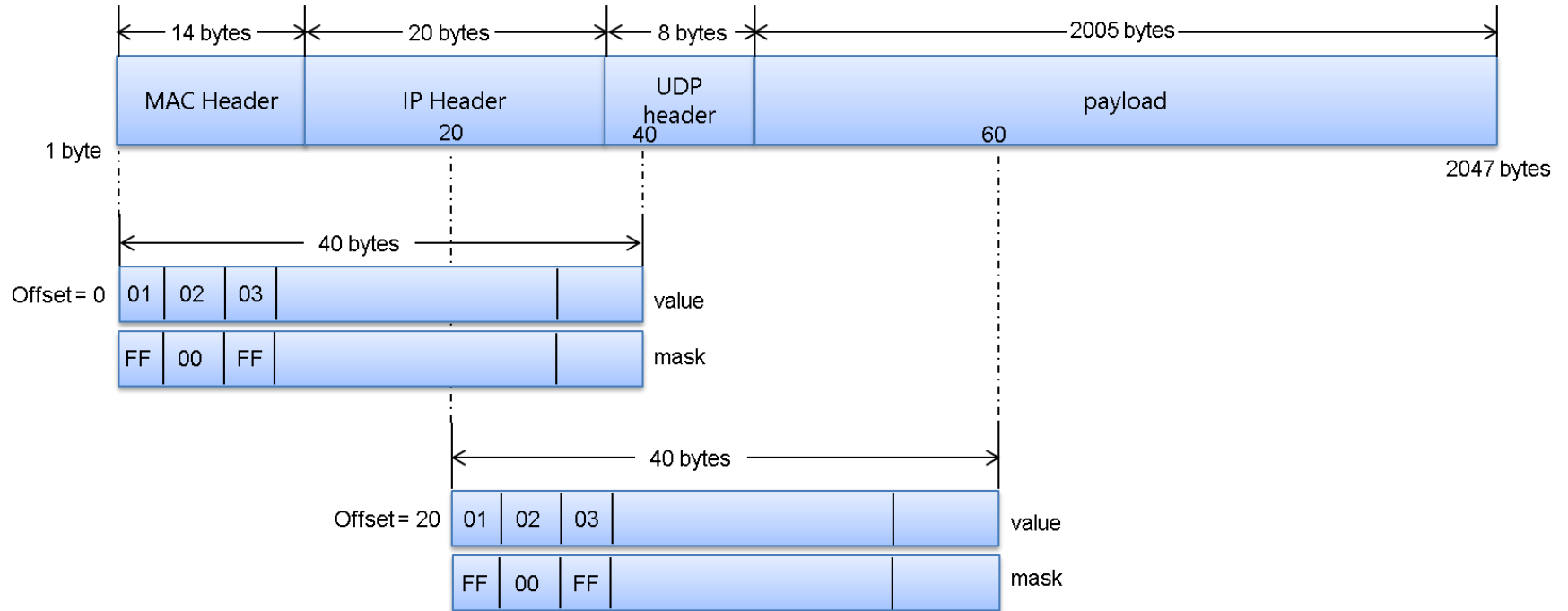
Packet Tap, Filter, Aggregation, Modification, and Output



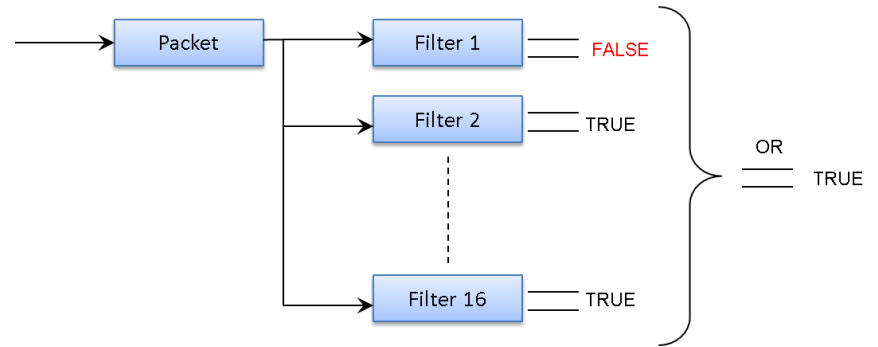
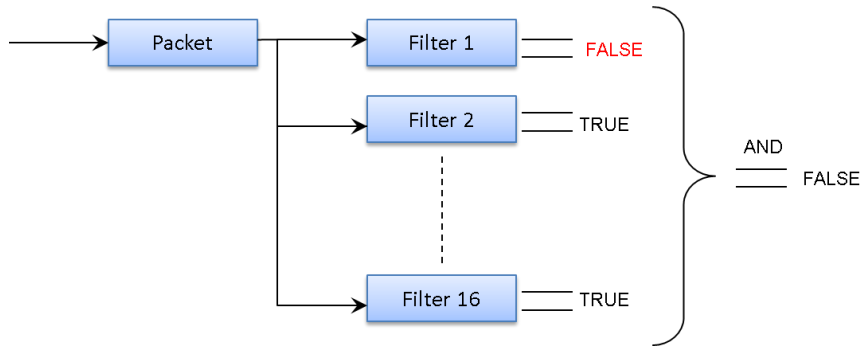
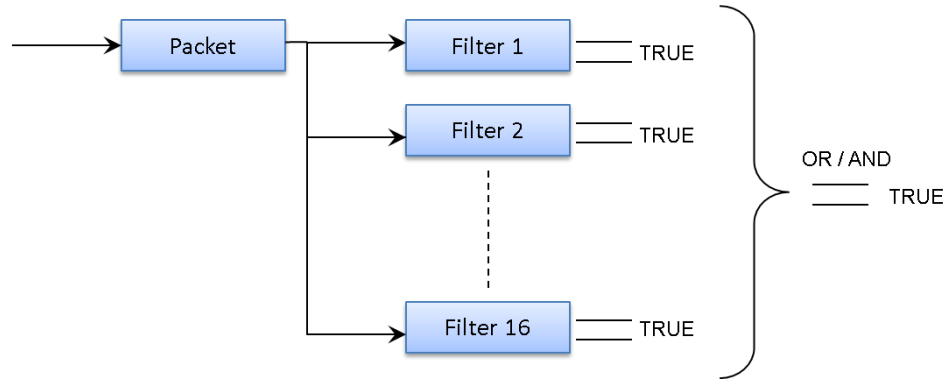
Capture Traffic of Interest



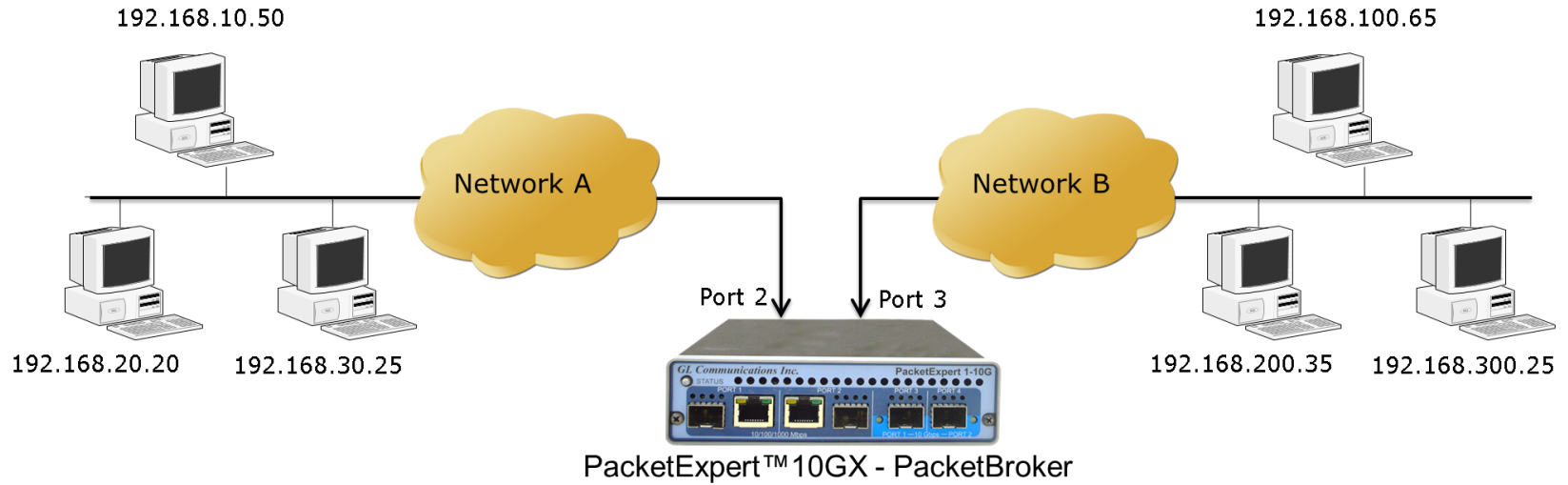
Header



Filter Combination



Filter Example



Filter Example (Contd.)

SIP and RTP between 192.168.10.50 192.168.300.25 undirectional (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

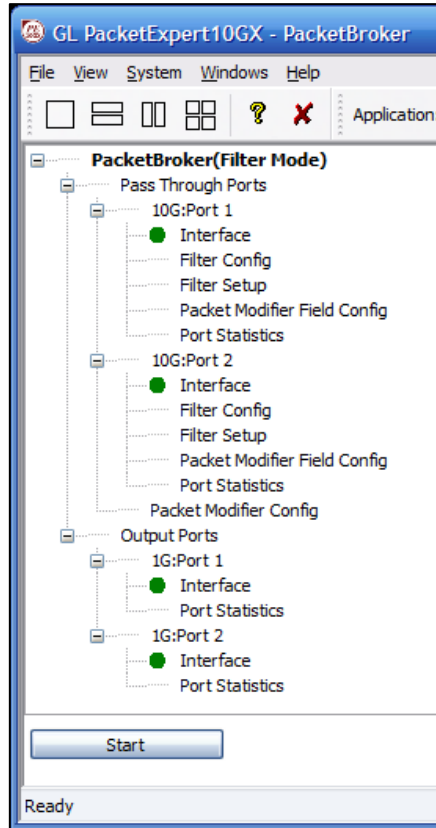
Filter 3

RTP traffic between 192.168.10.50 and 192.168.200.35

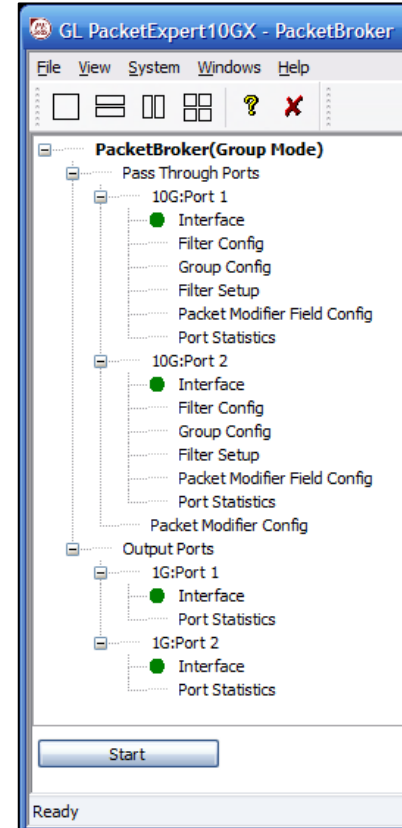
(Ethernet Len/Type = 0x0800(IP) AND
Source IP address = 192.168.10.50 AND
Destination IP Address = 192.168.200.35 AND
IP Protocol = 17 (UDP)
Source UDP port = 1025 AND
Destination UDP port == 1025 AND
Payload first byte(43rd byte) == 0x80 (RTP valid version)

Filter Configuration Menu

Basic Mode Filtering



Group Mode Filtering



Filter Configuration

Raw Mode Filtering

Filter Config

Port Selection: 10G:Port 1

☐ NOT

Filter Selection

- Layers
 - MAC
 - VLAN Layer
 - MPLS Layer
 - IP
 - UDP
 - TCP
 - Framesize
 - RAW Mode**

Filters

☒ Enable RAW Mode

RAW Mode

Offset: 0

Offset (0 - 15999)

Bytes	Value	Mask
0-7	00 00 00 00 01 02 00 00	FF FF FF FF FF 00 00
8-15	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
16-23	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
24-31	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
32-39	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
40-47	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
48-55	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
56-63	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
64-71	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
72-79	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
80-87	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00

120 Bytes Raw Data/Mask Bytes

16 Filters

Layer	Layer Summary
MAC	Src MAC = 00-00-00-00-01-02, Dst MAC = 00-00-00-00-01-03, Len/Type =
VLAN	VLAN Id = 12 , VLAN Priority = 0 - 7
MPLS	MPLS Label = 0 - 1048575
IPv4	Src IP = 192.168.1.11, Dst IP = 192.168.1.12, TOS = 0, Protocol = X
UDP	Src UDP Port = 400 - 600, Dst UDP Port = 5500 - 6000

Filter Configuration (Contd.)

Packet Mode Filtering

Filter Config

Port Selection 10G:Port 1

Packet Layers

Header fields

16 Filters

Packet Layer Summary

Filter Selection

NOT

Filter Selection

Layers

- MAC
- VLAN Layer
- MPLS Layer
- IP
- UDP
- TCP
- TCP Source Port
- TCP Destination Port
- Framesize
- RAW Mode

Filters

Enable TCP Source Port

TCP Source Port

Fixed Range

From == 2000 To 3000

Layer	Layer Summary
MAC	Src MAC = 00-00-00-00-01-02, Dst MAC = 00-00-00-00-01-03, Len/Type =
VLAN	VLAN Id = 12 , VLAN Priority = 0 - 7
MPLS	MPLS Label = 0 - 1048575
IPv4	Src IP = 192.168.1.11, Dst IP = 192.168.1.12, TOS = 0, Protocol = X
UDP	Src UDP Port = 400 - 600, Dst UDP Port = 5500 - 6000
TCP	Src TCP Port = 2000 - 3000, Dst TCP Port = 2123

Group Mode Filter Configuration

- PacketBroker™ includes an option to group the configured filters
- Any number of individual filters can be selected to form a group. Using “AND” and “OR” operators and any combination of filter groups can be created
- The multiple filter Groups created can be further grouped to form Super Groups using “AND” or “OR” operators
- The result of all the filters within the group is taken and either “OR” or “AND” and a final single Group result - TRUE or FALSE is obtained

The screenshot displays the 'Group Config' window, which is divided into two main sections: 'Group Config' and 'Super Group Config'.

Group Config Section:

- Port Selection:** 10G:Port 1
- Group List:** A table with 16 rows, each representing a group (Group1 to Group16). Group2 is selected.
- Filter Selection:** A list of 16 filters (Filter1 to Filter16). Filters 1, 5, 6, 10, and 12 are checked.
- Operation:** Radio buttons for 'AND' (selected) and 'OR'.
- Summary:** (Filter 1 & Filter 5 & Filter 6 & Filter 10 & Filter 12)
- Buttons:** Add, Delete, Clear.

Super Group Config Section:

- Enable Super Group:** A checkbox that is checked.
- Super Group List:** A table with 16 rows, each representing a super group (SuperGroup1 to SuperGroup16). SuperGroup1 is selected.
- Group Selection:** A list of 16 groups (Group1 to Group16). Groups 1, 4, 6, and 8 are checked.
- Operation:** Radio buttons for 'AND' and 'OR' (selected).
- Summary:** (Group1 || Group4 || Group6 || Group8)
- Buttons:** Add, Delete, Clear.

Additional UI Elements:

- A 'Hide Super Group' button is located at the top right of the Super Group Config section.
- The 'Group Config' section has a 'Group Config' title bar.
- The 'Super Group Config' section has a 'Super Group Config' title bar.

Dynamically Enable/Disable Filters

Filter Setup

In Ports

10G:Port 1

Filters

10G:Port 2

Filters

Aggregator

Enabled

Output 1G:Port 1

Out Ports

Aggregate Port (1G:Port 1)

Packet Modifier Enabled

Output Enabled

1G:Port 2

Packet Modifier Enabled

Output Enabled

Port Selection 10G:Port 1 Reset Activate All Deactivate All Operation OR

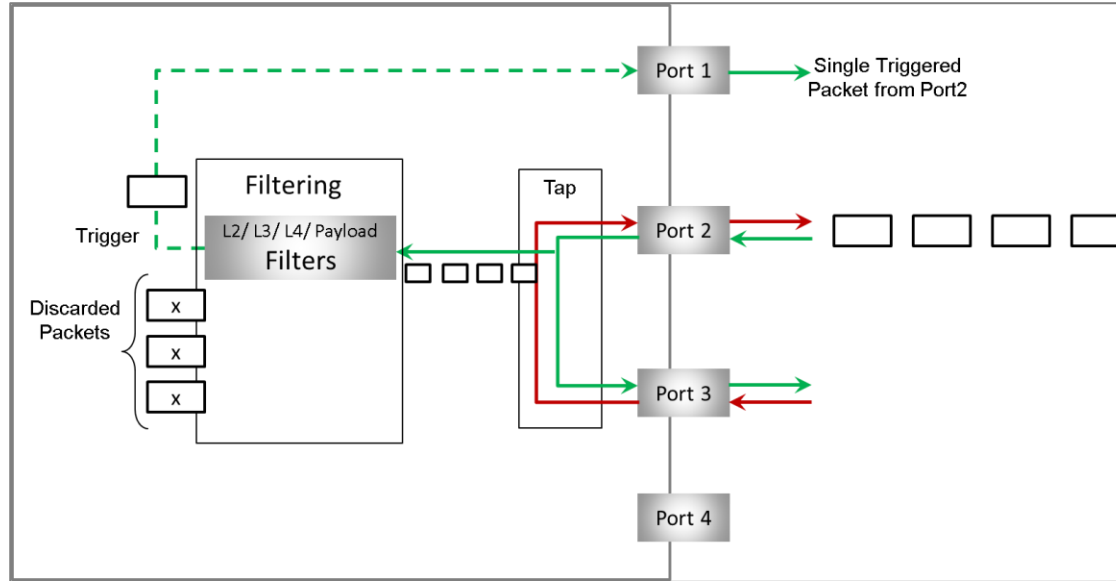
Filter Summary

Filter1 || Filter2 || Filter5 || Filter6 || Filter7 || Filter8
|| Filter9 || Filter10 || Filter11 || Filter12 || Filter13 || Filter14 || Filter15 || Filter16

Filter No	NOT	Filter Mode	Triggered/Filtered Packets	Triggered Status	Trigger
<input checked="" type="checkbox"/> 1	<input type="checkbox"/> NOT	Continuous	0		
<input checked="" type="checkbox"/> 2	<input type="checkbox"/> NOT	Mono Trigger	0	● Idle	Set

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

Filter Trigger Mode (Basic)

Filter Setup

In Ports

10G:Port 1

Filters

10G:Port 2

Filters

Aggregator

Enabled

Output 1G:Port 2

Out Ports

1G:Port 1

Packet Modifier Enabled

Output Enabled

Aggregate Port (1G:Port 2)

Packet Modifier Enabled

Output Enabled

Port Selection 10G:Port 1

Reset

Activate All

Deactivate All

Operation OR

Filter Summary

Filter1 || Filter2 || Filter3 || Filter4 || Filter5 || Filter6 || Filter7 || Filter8 ||
Filter9 || Filter10 || Filter11 || Filter12 || Filter13 || Filter14 || Filter15 || Filter16 ||

Filter No	NOT	Filter Mode	Triggered/Filtered Packets	Triggered Status	Trigger
<input checked="" type="checkbox"/> 1	<input type="checkbox"/> NOT	Mono Trigger	3	✓ Triggered	Set
<input checked="" type="checkbox"/> 2	<input type="checkbox"/> NOT	Mono Trigger	1	✓ Triggered	Set
<input checked="" type="checkbox"/> 3	<input type="checkbox"/> NOT	Mono Trigger	3	✓ Triggered	Set
<input checked="" type="checkbox"/> 4	<input type="checkbox"/> NOT	Mono Trigger	1	✓ Triggered	Set
<input checked="" type="checkbox"/> 5	<input type="checkbox"/> NOT	Mono Trigger	1	✓ Triggered	Set
<input checked="" type="checkbox"/> 6	<input type="checkbox"/> NOT	Mono Trigger	2	✓ Triggered	Set
<input checked="" type="checkbox"/> 7	<input type="checkbox"/> NOT	Mono Trigger	3	✓ Triggered	Set
<input checked="" type="checkbox"/> 8	<input type="checkbox"/> NOT	Mono Trigger	1	✓ Triggered	Set
<input checked="" type="checkbox"/> 9	<input type="checkbox"/> NOT	Mono Trigger	1	✓ Triggered	Set
<input checked="" type="checkbox"/> 10	<input type="checkbox"/> NOT	Mono Trigger	5	✓ Triggered	Set
<input checked="" type="checkbox"/> 11	<input type="checkbox"/> NOT	Mono Trigger	1	✓ Triggered	Set
<input checked="" type="checkbox"/> 12	<input type="checkbox"/> NOT	Mono Trigger	6	✓ Triggered	Set
<input checked="" type="checkbox"/> 13	<input type="checkbox"/> NOT	Continuous	671 496		
<input checked="" type="checkbox"/> 14	<input type="checkbox"/> NOT	Continuous	671 960		
<input checked="" type="checkbox"/> 15	<input type="checkbox"/> NOT	Continuous	672 439		
<input checked="" type="checkbox"/> 16	<input type="checkbox"/> NOT	Continuous	672 903		

Filter Trigger Mode (Group mode)

Filter Setup

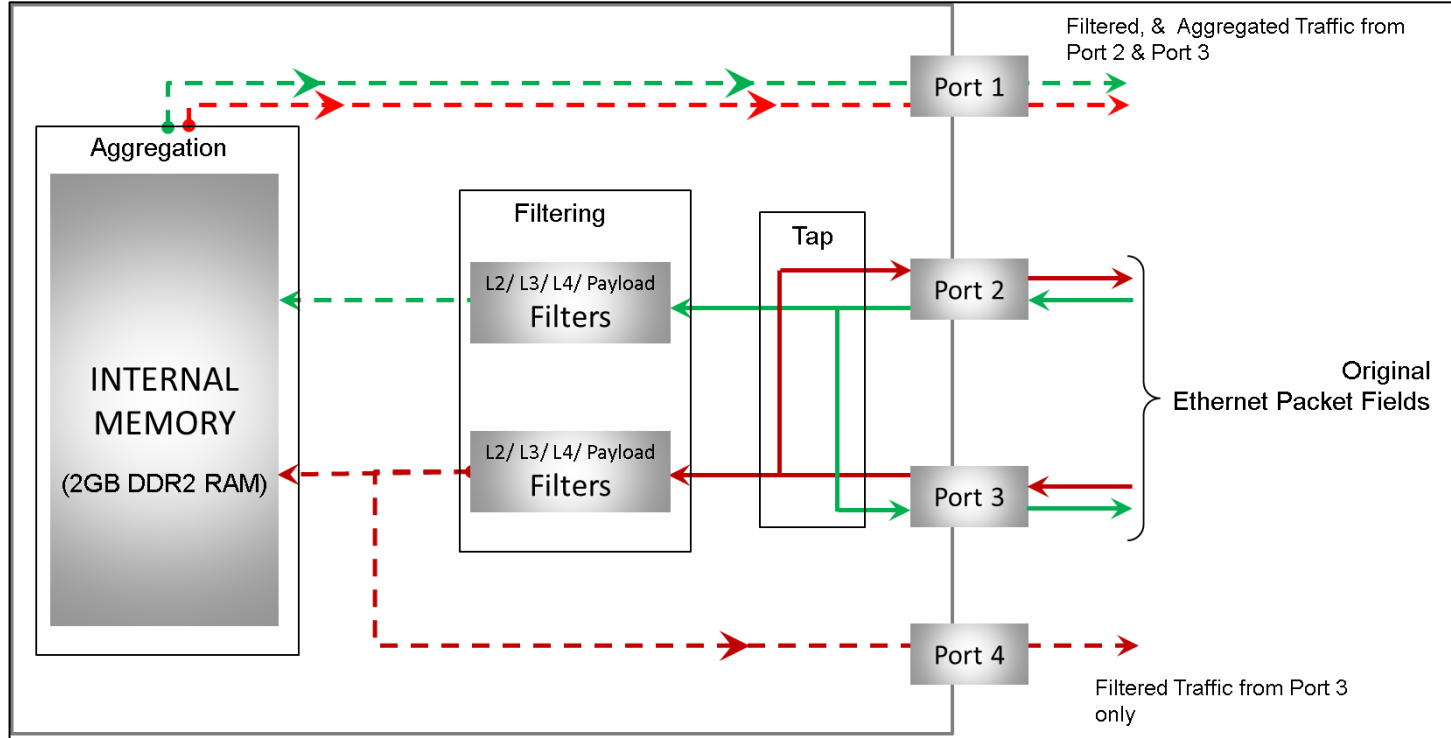
The diagram illustrates the Filter Setup interface. It shows a flow from In Ports (Port 1 and Port 2) through an Aggregator (Disabled) to Out Ports (Port 3 and Port 4). Each Out Port has a Packet Modifier (Disabled) and an Output (Enabled) setting. A Port Selection dropdown is set to Port 1, with a Reset button. There are also buttons for Activate All and Deactivate All, and a Pulse Width setting of 200 msec.

Group Summary

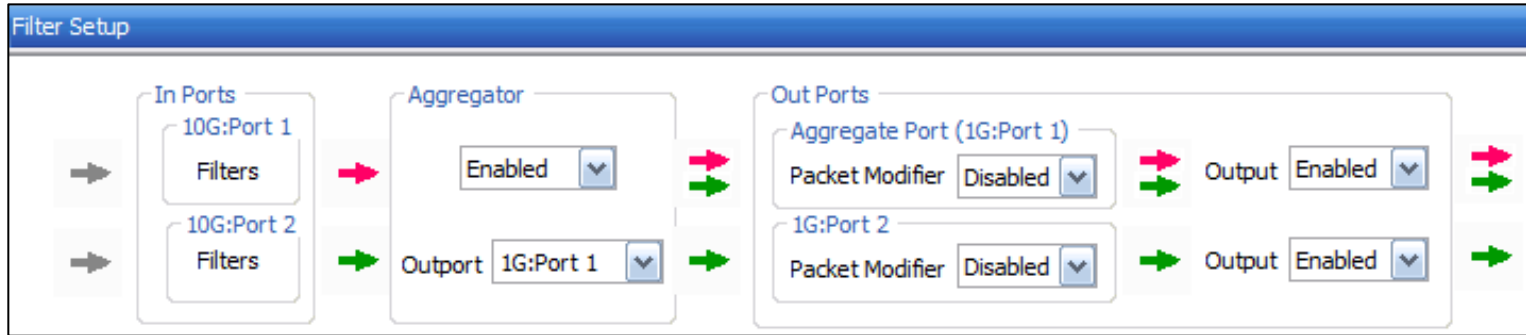
((!Filter7 && Filter2))((Filter2 && Filter1 && Filter3 && Filter5) || (Filter1 && Filter4))

Group Name	Group Mode	Triggered/Filtered Packets	Triggered Status	Trigger	TTL
<input checked="" type="checkbox"/> SuperGroup1	MonoTrigger	1	✓ Triggered	Set	NONE
<input checked="" type="checkbox"/> SuperGroup2	MonoTrigger	0	● Waiting	Set	TTL1
<input checked="" type="checkbox"/> SuperGroup3	MonoTrigger	0	● Waiting	Set	TTL3
<input checked="" type="checkbox"/> SuperGroup4	MonoTrigger	1	✓ Triggered	Set	NONE
<input checked="" type="checkbox"/> SuperGroup5	MonoTrigger	1	✓ Triggered	Set	NONE
<input checked="" type="checkbox"/> SuperGroup6	MonoTrigger	0	● Waiting	Set	TTL7
<input checked="" type="checkbox"/> SuperGroup7	MonoTrigger	0	● Waiting	Set	TTL8
<input checked="" type="checkbox"/> SuperGroup8	MonoTrigger	1	✓ Triggered	Set	TTL9
<input checked="" type="checkbox"/> SuperGroup9	Continuous	665 899			NONE
<input checked="" type="checkbox"/> SuperGroup10	Continuous	666 371			NONE
<input checked="" type="checkbox"/> SuperGroup11	Continuous	666 836			NONE
<input checked="" type="checkbox"/> SuperGroup12	Continuous	667 301			NONE
<input type="checkbox"/> SuperGroup13	Continuous	0			NONE
<input type="checkbox"/> SuperGroup14	Continuous	0			NONE
<input type="checkbox"/> SuperGroup15	Continuous	0			NONE
<input type="checkbox"/> SuperGroup16	Continuous	0			NONE

Packet Aggregation

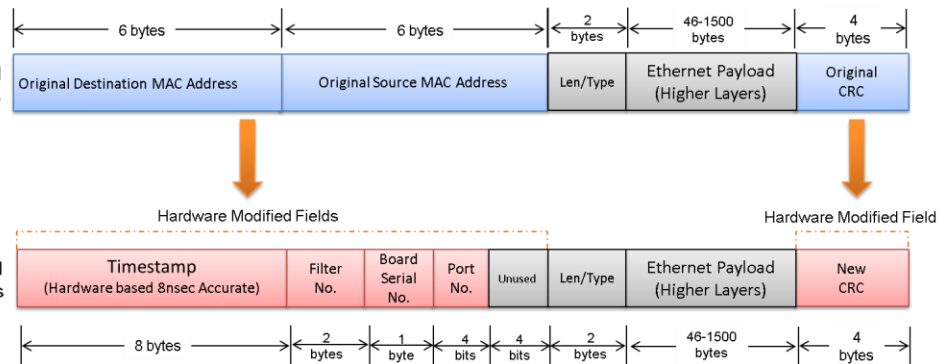
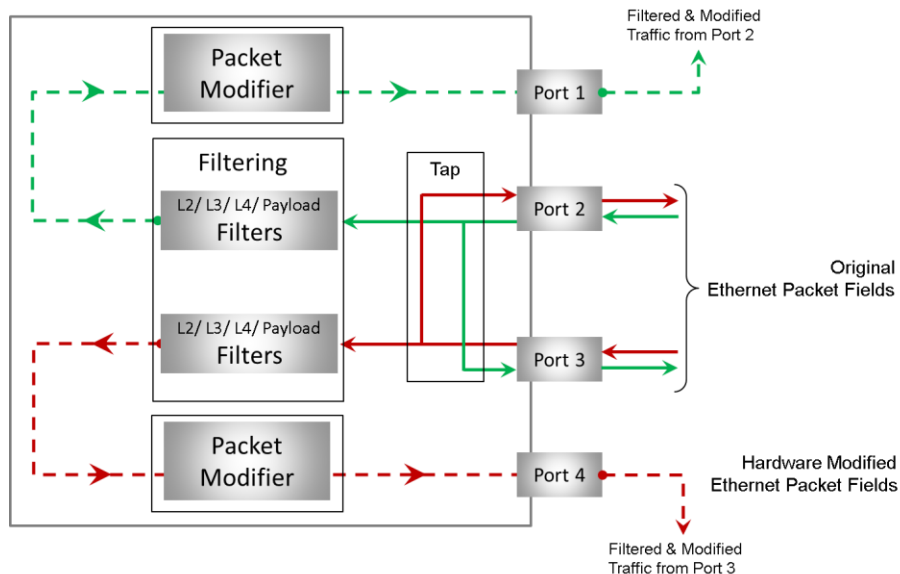


Packet Aggregation User Interface



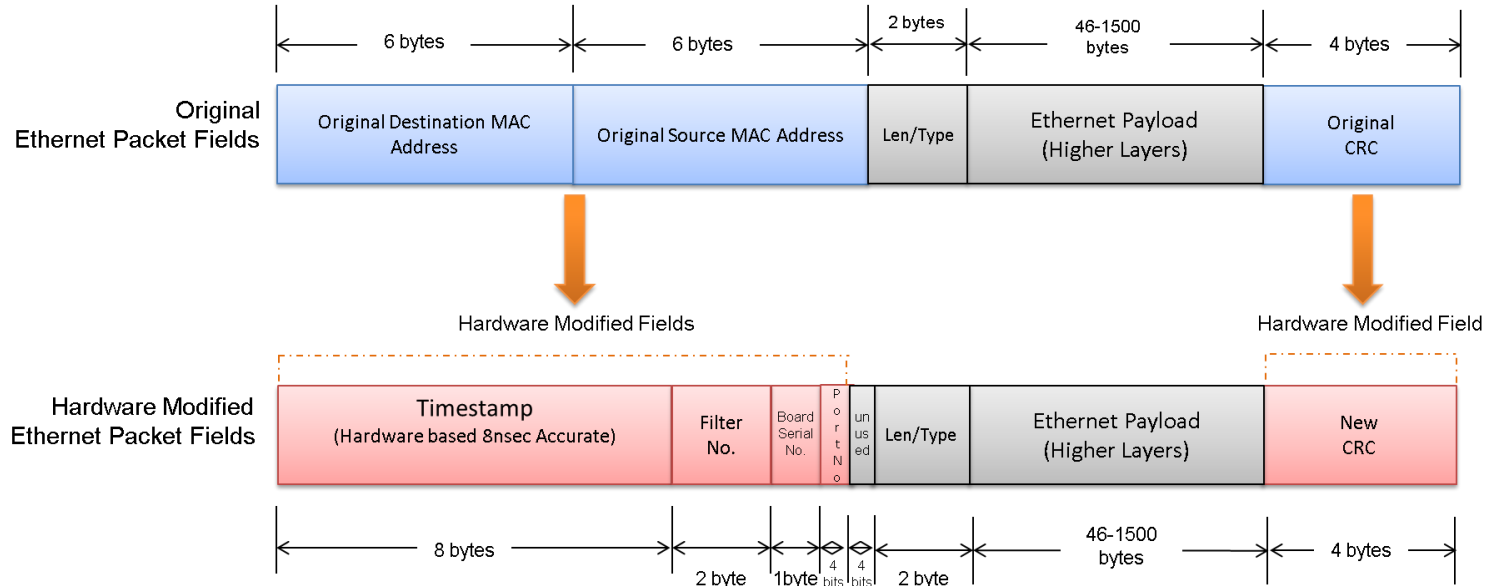
- The filtered traffic is combined and sent out through a single output port
- If the combined bandwidth exceeds the wirespeed of the output port, may cause packet loss
- Hence, the onboard memory (2 GB DR2 RAM) is used as a temporary buffer to store the traffic before sent out at wirespeed. Thus, upto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



- 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.)

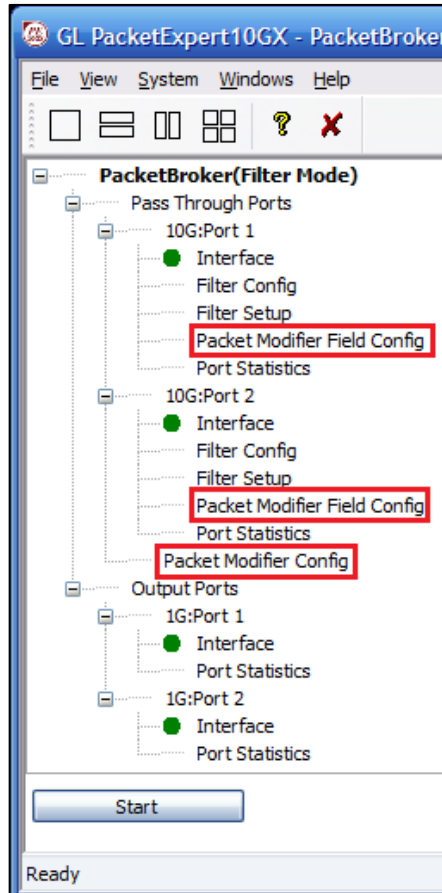
Packet Modifier Enable/Disable

Filter Setup

In Ports	Aggregator	Out Ports
Port 2 Filters	Enabled	Port 1 Packet Modifier Disabled
Port 3 Filters	Output 4	Aggregate Port (P4) Packet Modifier Enabled
		Output Disabled
		Output Disabled

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

Packet Modifier Field Config Menu



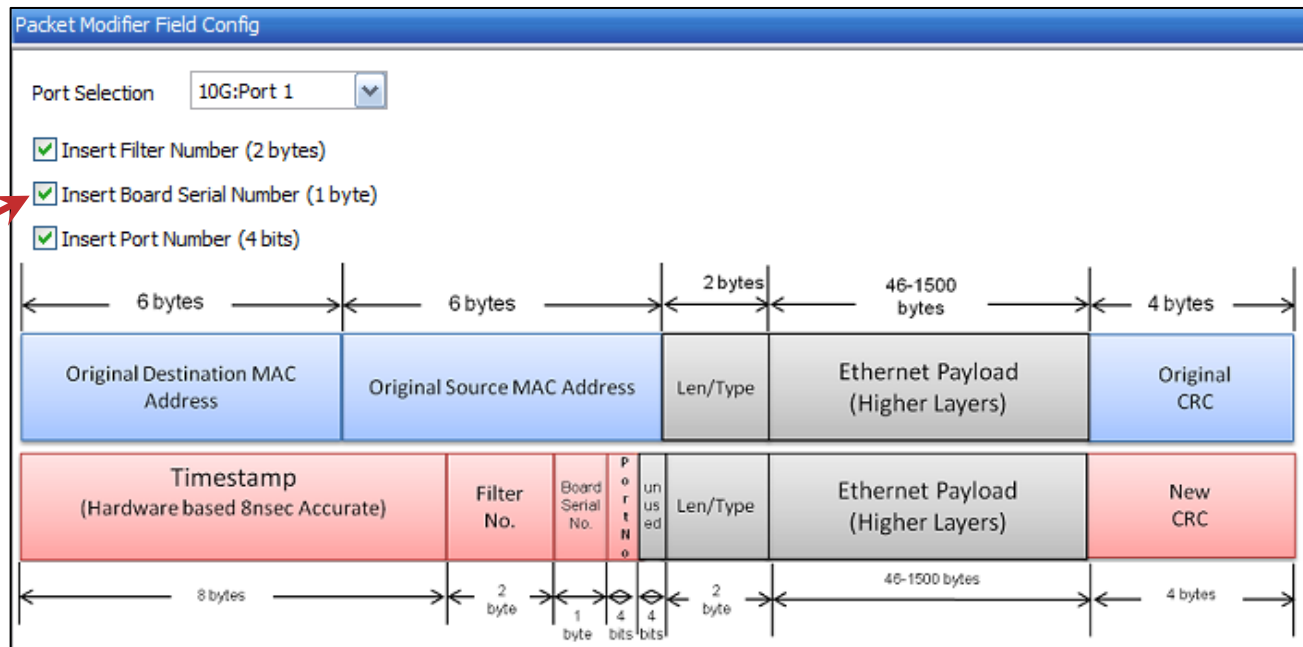
Packet Modifier Field Configuration

Packet Modifier Config

Board Serial No

☒ Take From Hardware

☐ User Configured (0-255)



Packet Modifier Board Serial Number Config

Packet Modifier Config

Board Serial No

☒ Take From Hardware

☐ User Configured (0-255)

Device Information

Number Of Devices

Device Details	Name	Serial Number	Model Number	USB Type	DDR Module Part Number
	Device1	188174	7.1	Unknown	16KTF1G64HZ-1G6E1

MAC Addresses	Port #1	Port #2	Port #3	Port #4
	00-21-C2-00-25-7E	00-21-C2-00-25-81	00-21-C2-00-25-7F	00-21-C2-00-25-80

10G License	Description	Part#	License Type	Licensed Status
	10G/2.5G Option For PXN100	PXN101	Optional License	✓

License Details	Application Name	Part#	License Type	Licensed Status
	All Port Bert	PXN100	Basic	-NA-
	RFC 2544	PXN100	Basic	-NA-
	RFC 2544 (Single Port)	PXN100	Basic	-NA-
	All Port Loopback	PXN100	Basic	-NA-
	Bert/Loopback	PXN100	Basic	-NA-
	IPLinkSim	IPN507	Optional License	✓
	Record Only	PXN105	Optional License	✓
	PacketBroker	PXN107	Optional License	✓
	Playback Only	PXN105	Optional License	✓
	Record And Playback	PXN105	Optional License	✓
	ExpertSAM	PXN106	Optional License	✓
	IPNetSim	IPN507	Optional License	✓
	ExpertTCP	PXN108	Optional License	✓
	Multi-Stream Traffic Generator & Analyzer	PXN108	Optional License	✓
	Multi-Stream Traffic Generator & Analyzer (Dual Device)	PXN108	Optional License	✓

OK

Port Statistics

Port Statistics

Port Selection: 10G:Port 1

Description	Tx	Rx
Total Frames	393 325 896	393 348 296
Valid Frames	393 326 918	393 349 354
Bad Frames	0	0
Number of Bytes	595 498 501 138	595 533 950 190
Link Utilisation(%)	100.000	100.000
Data Rate(Mbps)	9869.681	9869.681
Frame Rate(Frames/sec)	814868	814868
Non Test Frames	0	0
Broadcast Frames	0	0
Multicast Frames	0	393 354 512
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	0
128-255 Byte Length Frames	0	0
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	0	0
1024-1518 Byte Length Frames	393 341 784	393 366 705
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	-	393 376 953
IPv6 Packets	-	0

Port Statistics

Port Selection: 1G:Port 1

Description	Tx	Rx
Total Frames	8 596 018	0
Valid Frames	8 596 117	0
Bad Frames	0	0
Number of Bytes	13 014 675 566	0
Link Utilisation(%)	100.000	0.000
Data Rate(Mbps)	986.958	0.000
Frame Rate(Frames/sec)	81486	0
Non Test Frames	0	0
Broadcast Frames	0	0
Multicast Frames	8 596 585	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	0
128-255 Byte Length Frames	0	0
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	0	0
1024-1518 Byte Length Frames	8 597 604	0
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	-	0
IPv6 Packets	-	0

Thank You