PacketExpert™ 10GX – PacketBroker™

(Wire-speed Ethernet Tap)

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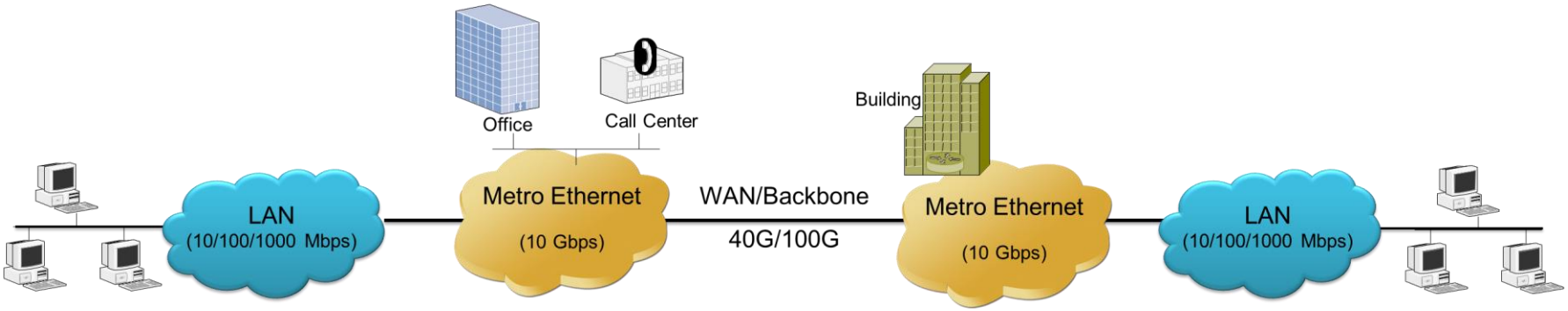
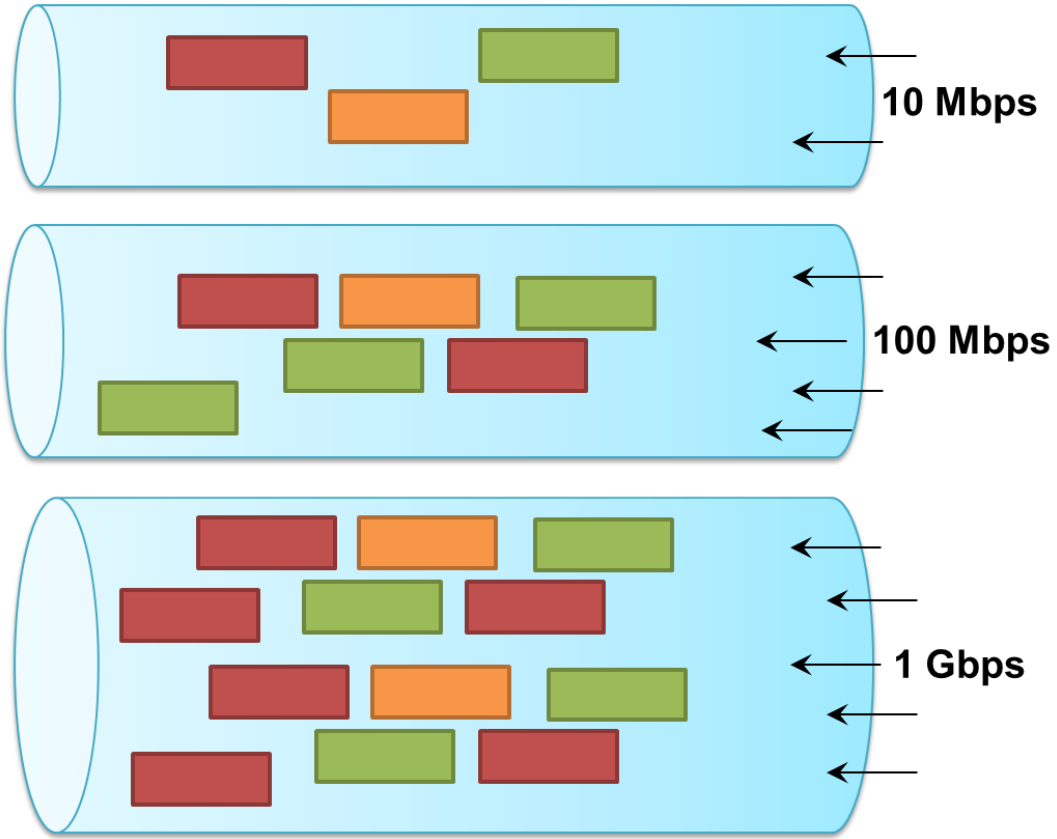
Ethernet Technology

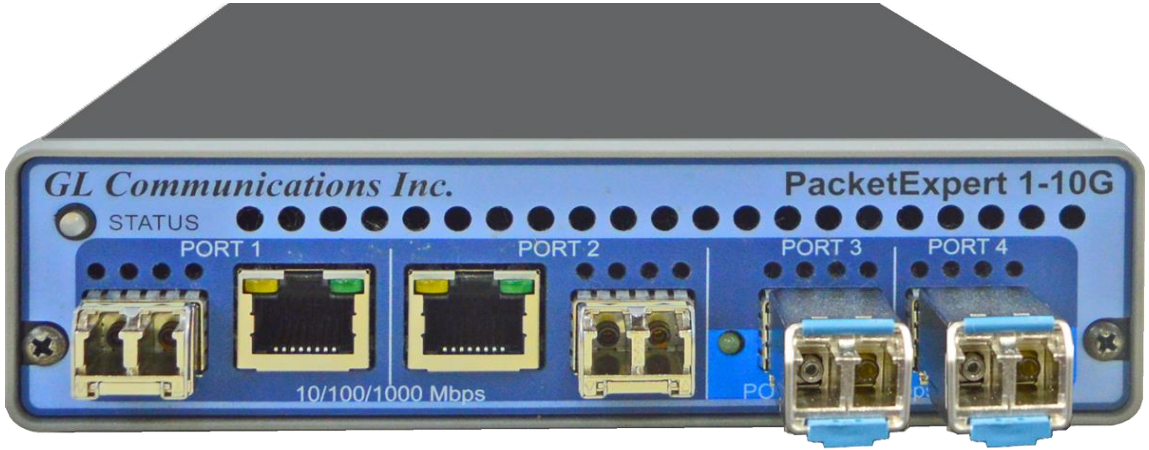


- Ethernet has become ubiquitous in both Local Area Networks and Wide Area Networks
- Network engineers require the ability to capture the traffic at different locations in the network

Just bigger Pipes, but same Ethernet Packets



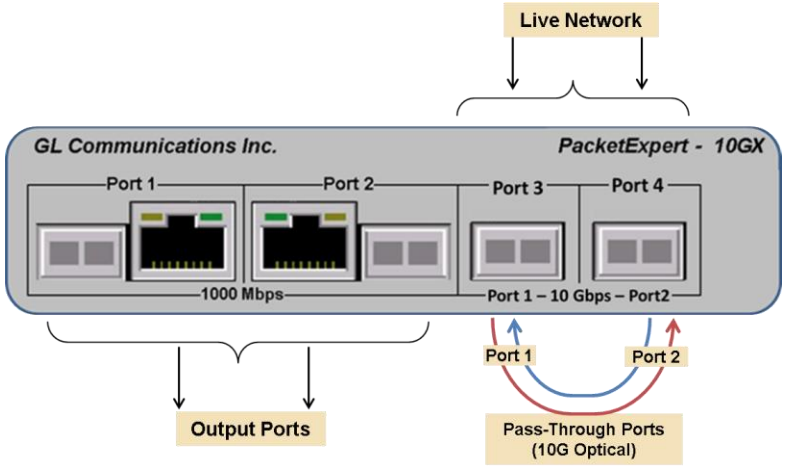
PacketExpert™ 10GX (10G/2.5G/1G)



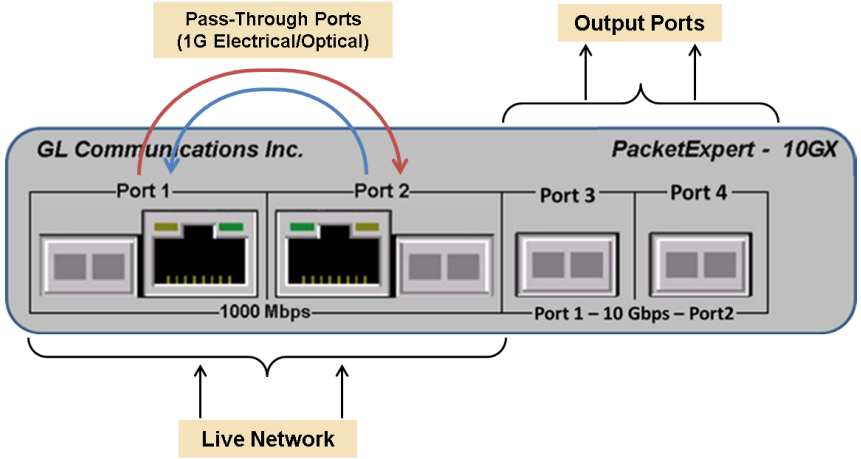
- Bit Error Rate Testing
- RFC 2544
- Smart Loopback Functionality
- ITU-T Y.1564 (Verify service level agreements)
- Wirespeed Record/Playback Capability
- Multi-Stream Traffic Generator
- PacketBroker
- RFC 6349 (TCP Testing)
- IP Wide Area Network Emulation

Active Network Tap

For 1G Ports

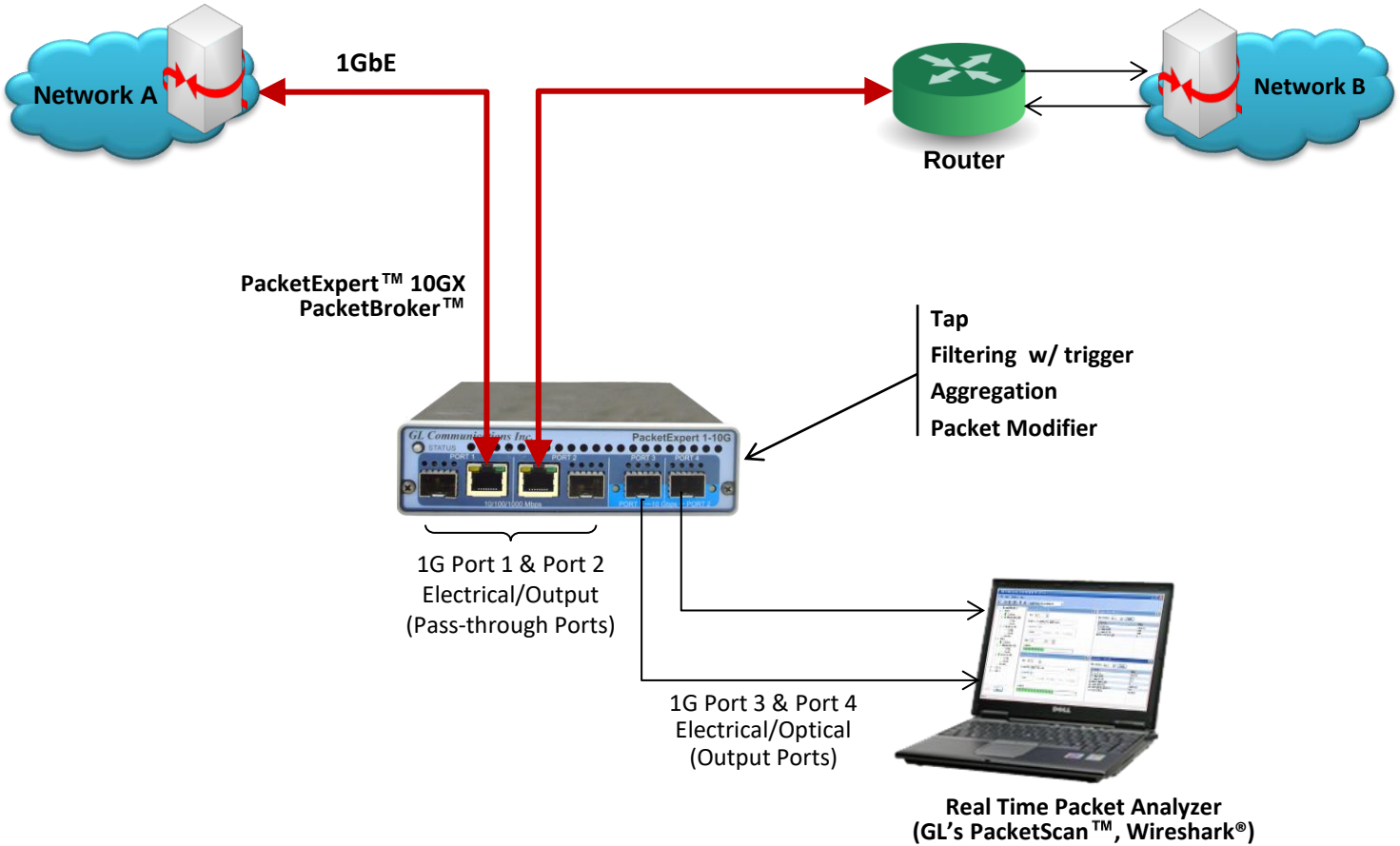


For 10G Ports

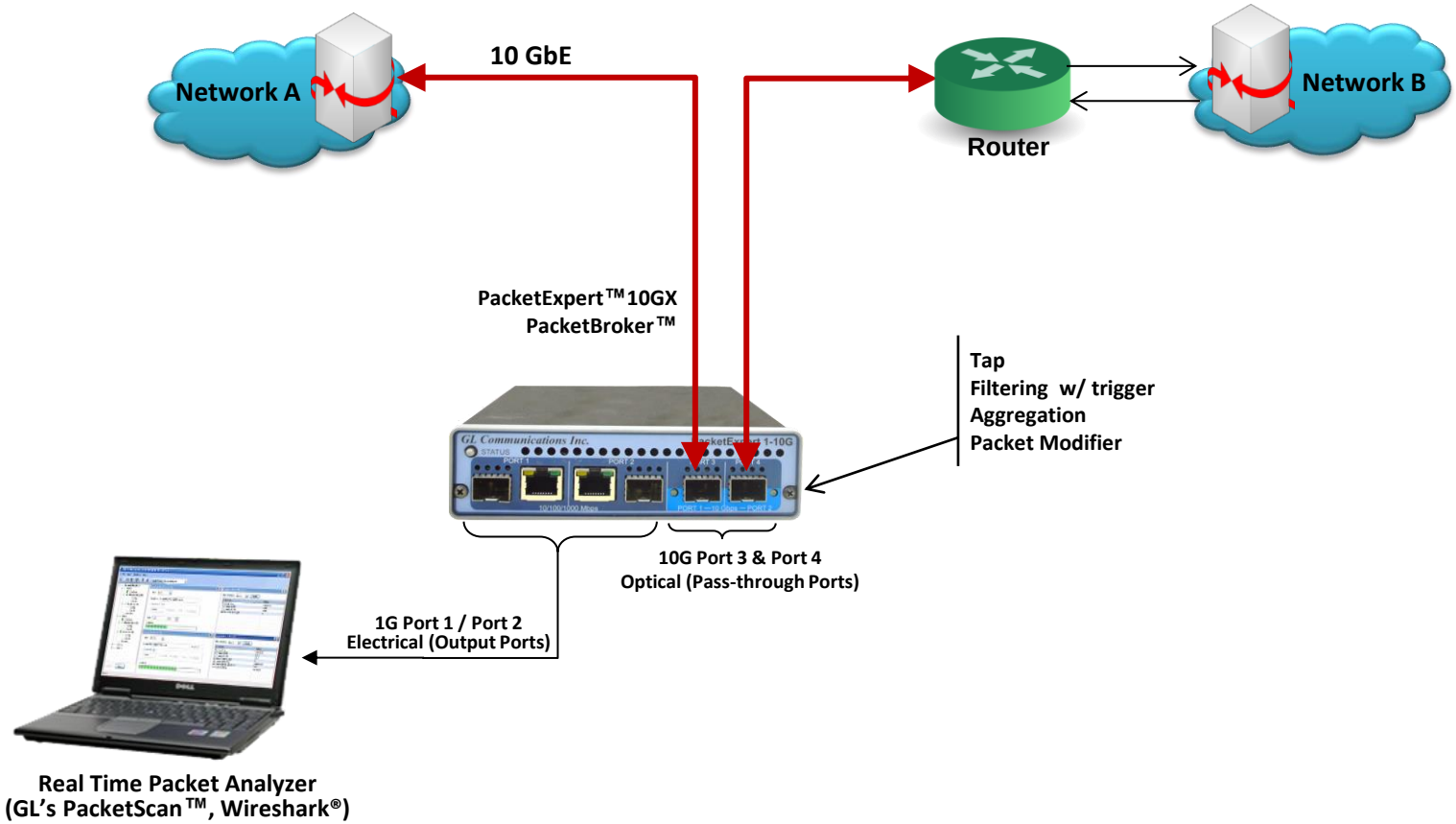


- Dedicated hardware device - FPGA based processing means full 100% wirespeed capability to pass through traffic no drops, no delays, and also to make two separate copies - Tx and Rx side
- Hardware filters means wirespeed filtering

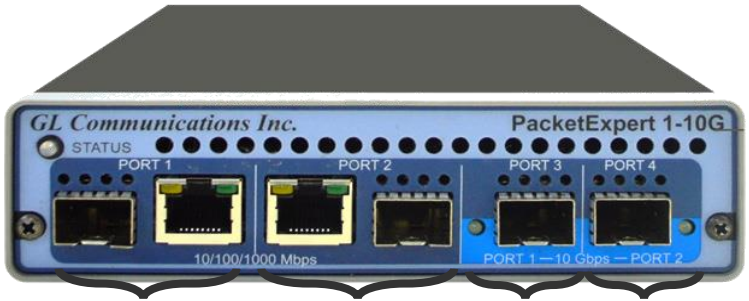
PacketBroker™ in Network (1GbE)



PacketBroker™ in Network (10GbE)



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



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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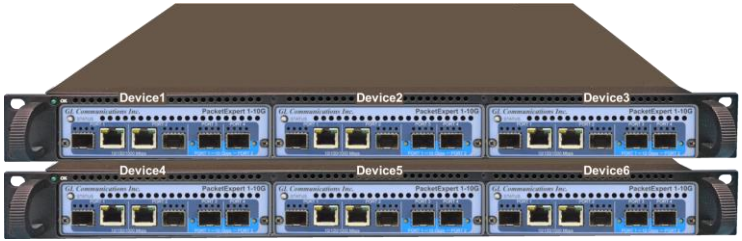
MTOP™ Rack Units

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

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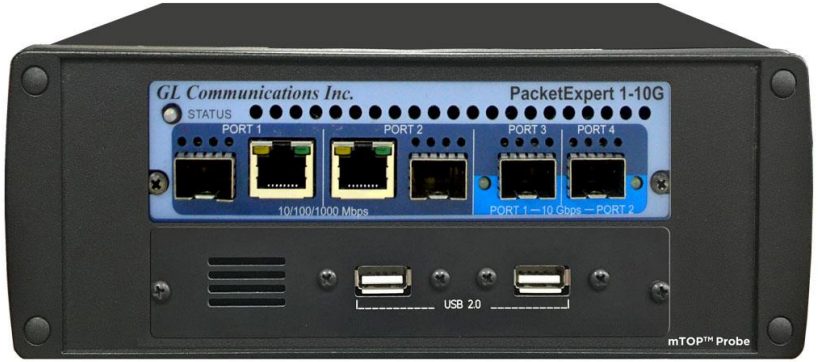
mTOP™ Probe with 10GX Hardware Unit + SBC



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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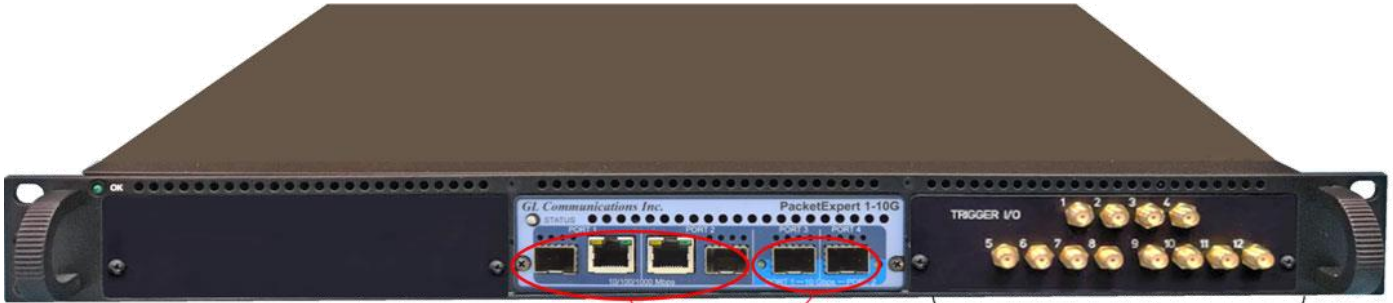
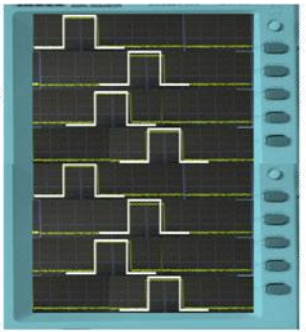
MTOP™ PacketBroker™ Rack Unit w/ 12 TTL Triggers



1G | 10G
Pass-through Ports

1 to 12
TTL Signals

Oscilloscope



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

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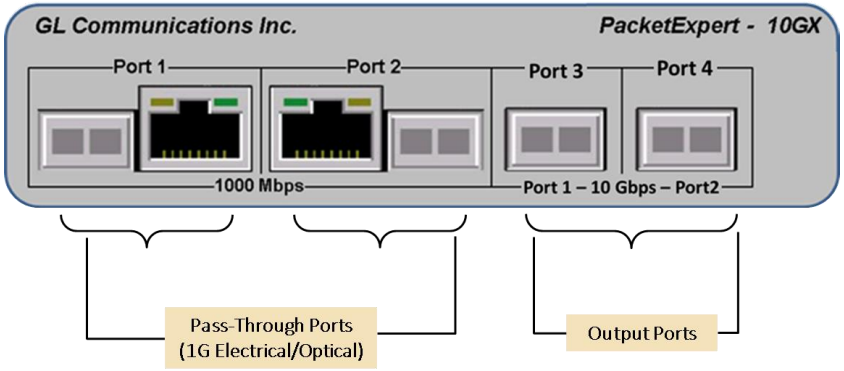
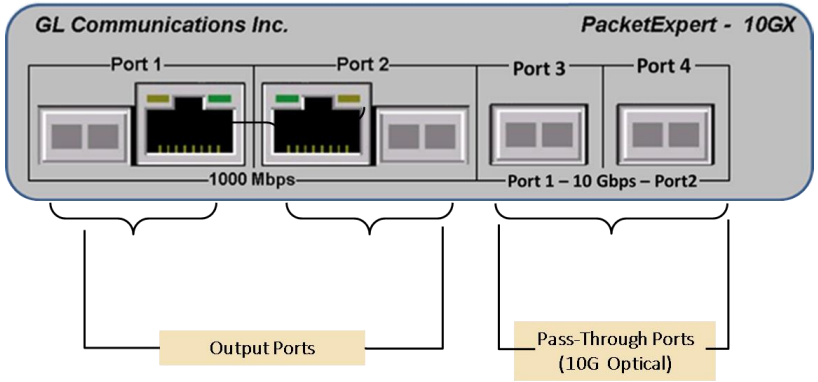
Features





- 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

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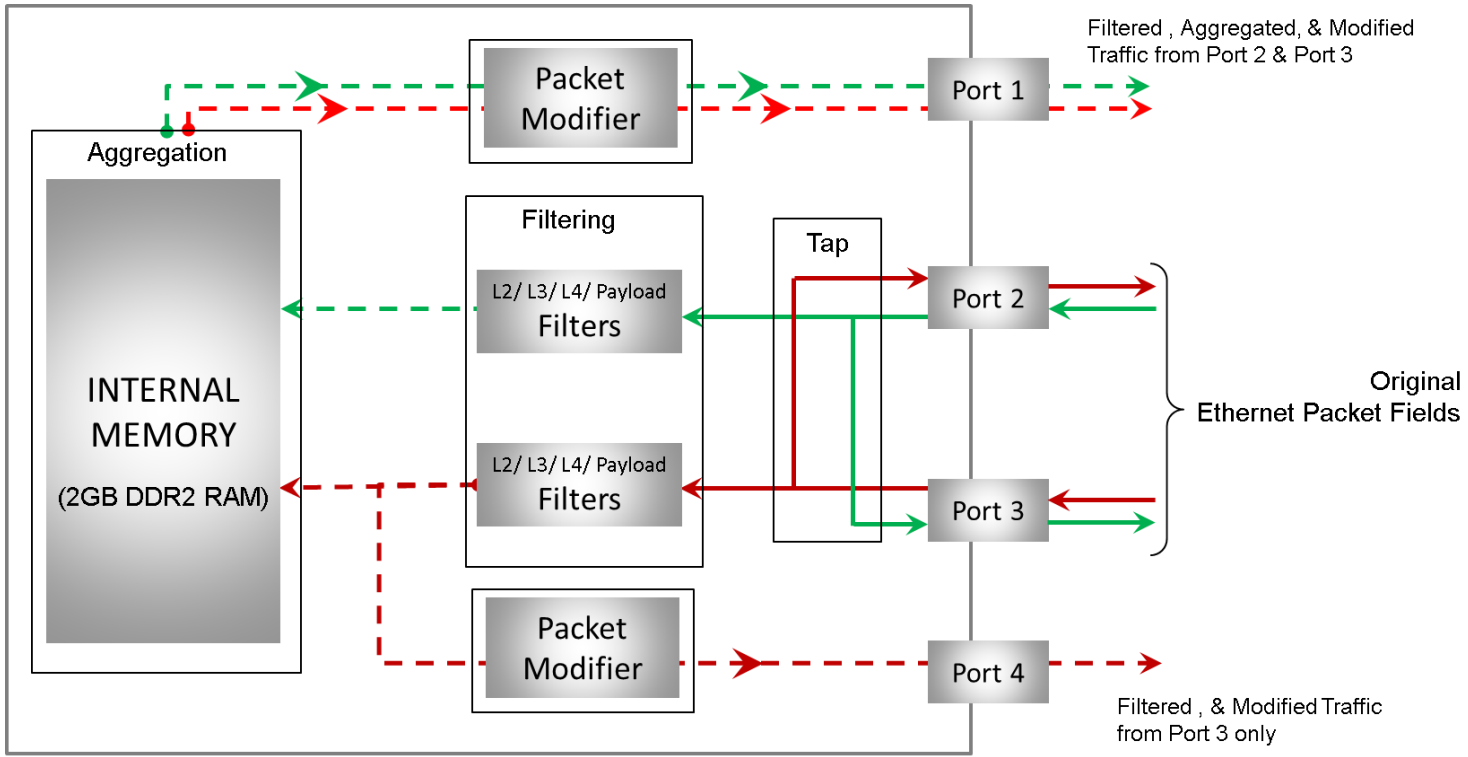
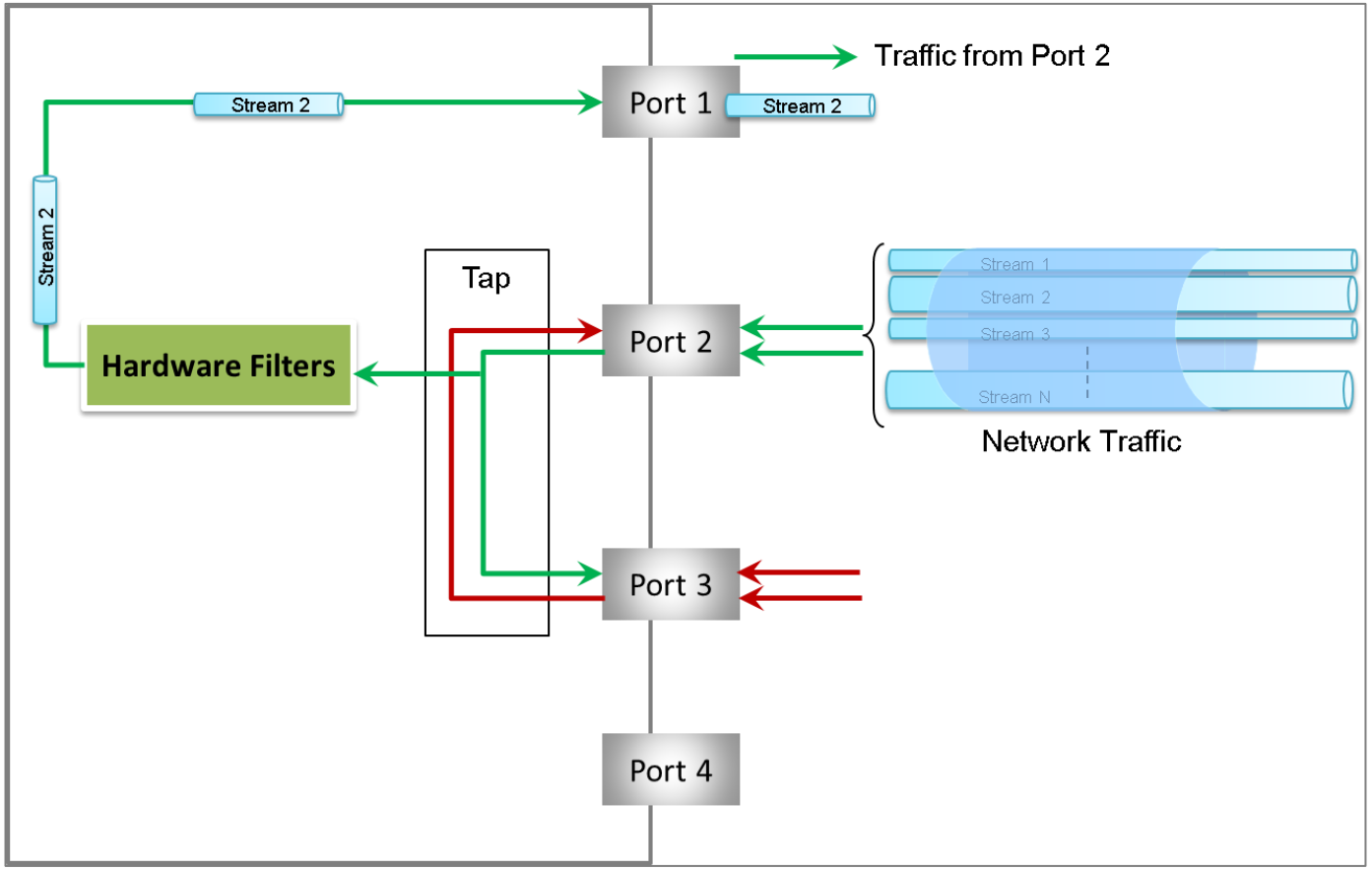
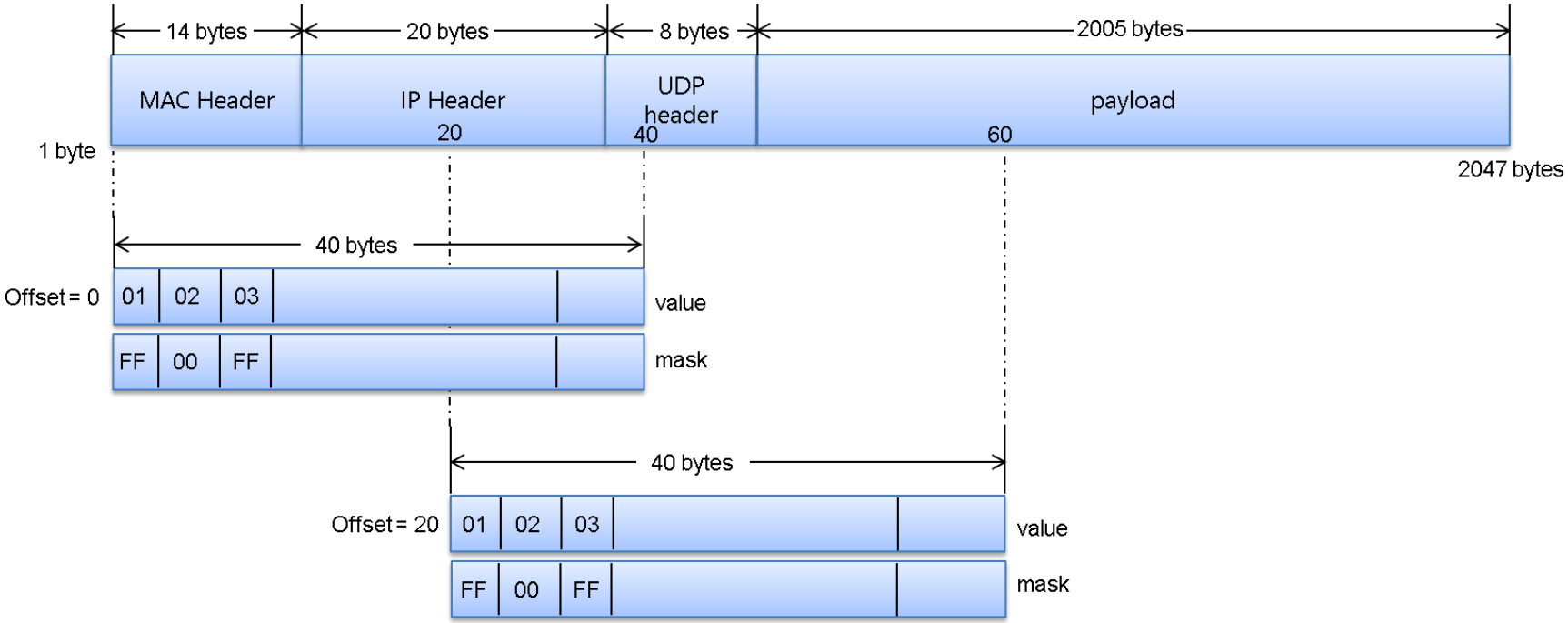
Packet Tap, Filter, Aggregation, Modification, and Output



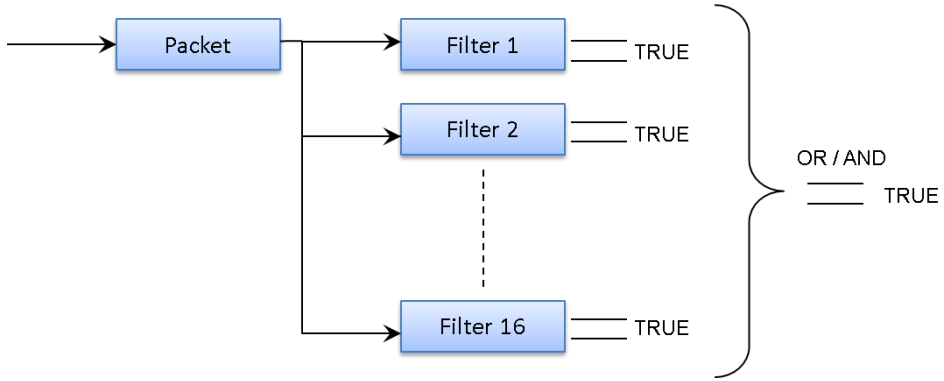
Capture Traffic of Interest

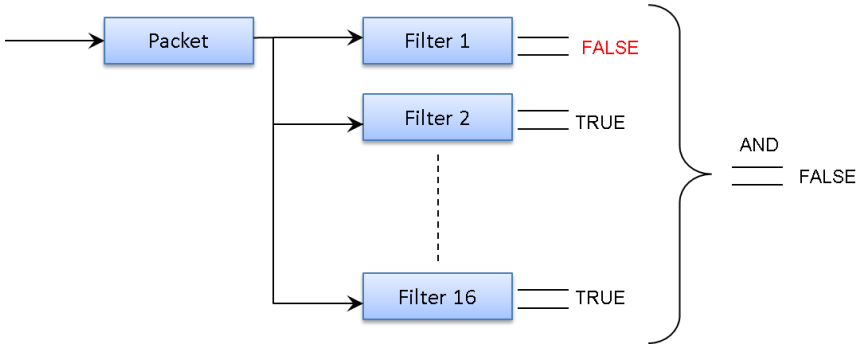


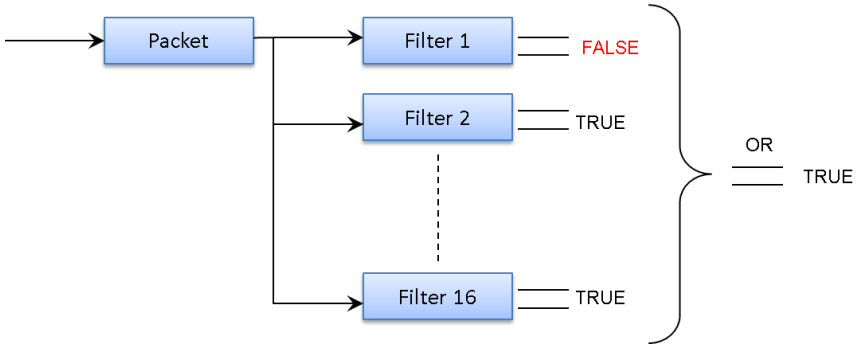
Header


14 bytes
20 bytes
8 bytes
2005 bytes
MAC Header
IP Header
UDP header
payload
1 byte
20
40
60
2047 bytes
40 bytes
Offset = 0
01
02
03
value
FF
00
FF
mask
40 bytes
Offset = 20
01
02
03
value
FF
00
FF
mask

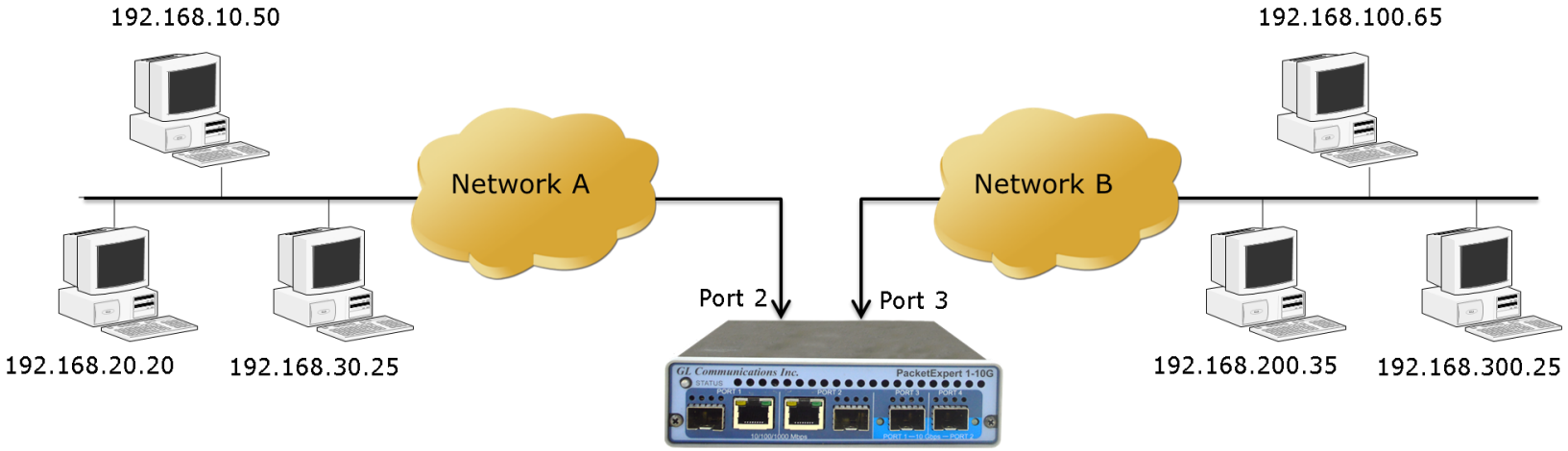
Filter Combination







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

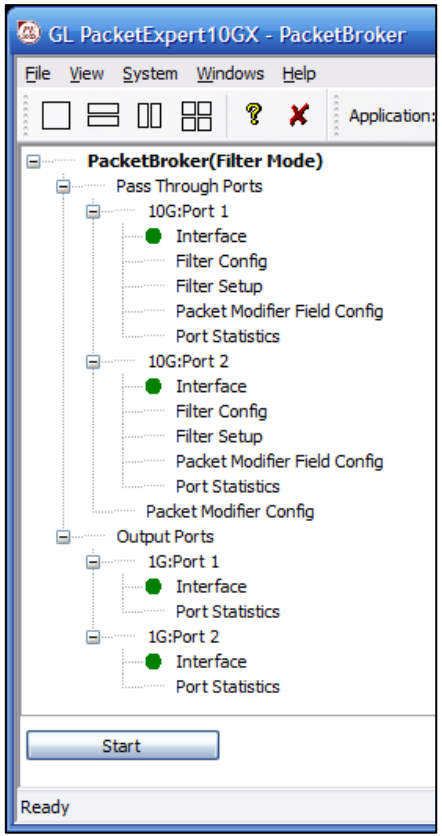
Filter 3

RTP traffic between 192.168.10.50 and 192.168.200.35

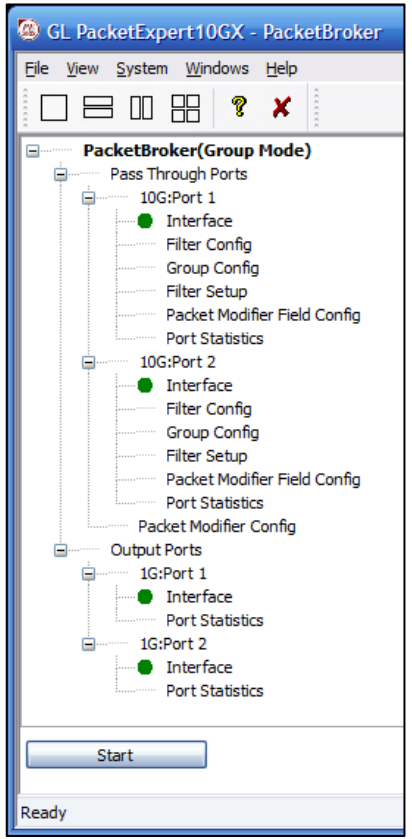
Ethernet Len/Type = 0x0800(IP) AND
Source IP address = 192.168.10.50 AND
Destination IP Address = 192.168.200.35 AND
IP Protocol = 17 (UDP)
Source UDP port = 1025 AND
Destination UDP port == 1025 AND
Payload first byte(43rd byte) == 0x80 (RTP valid version)

Filter Configuration Menu

Basic Mode Filtering



Group Mode Filtering



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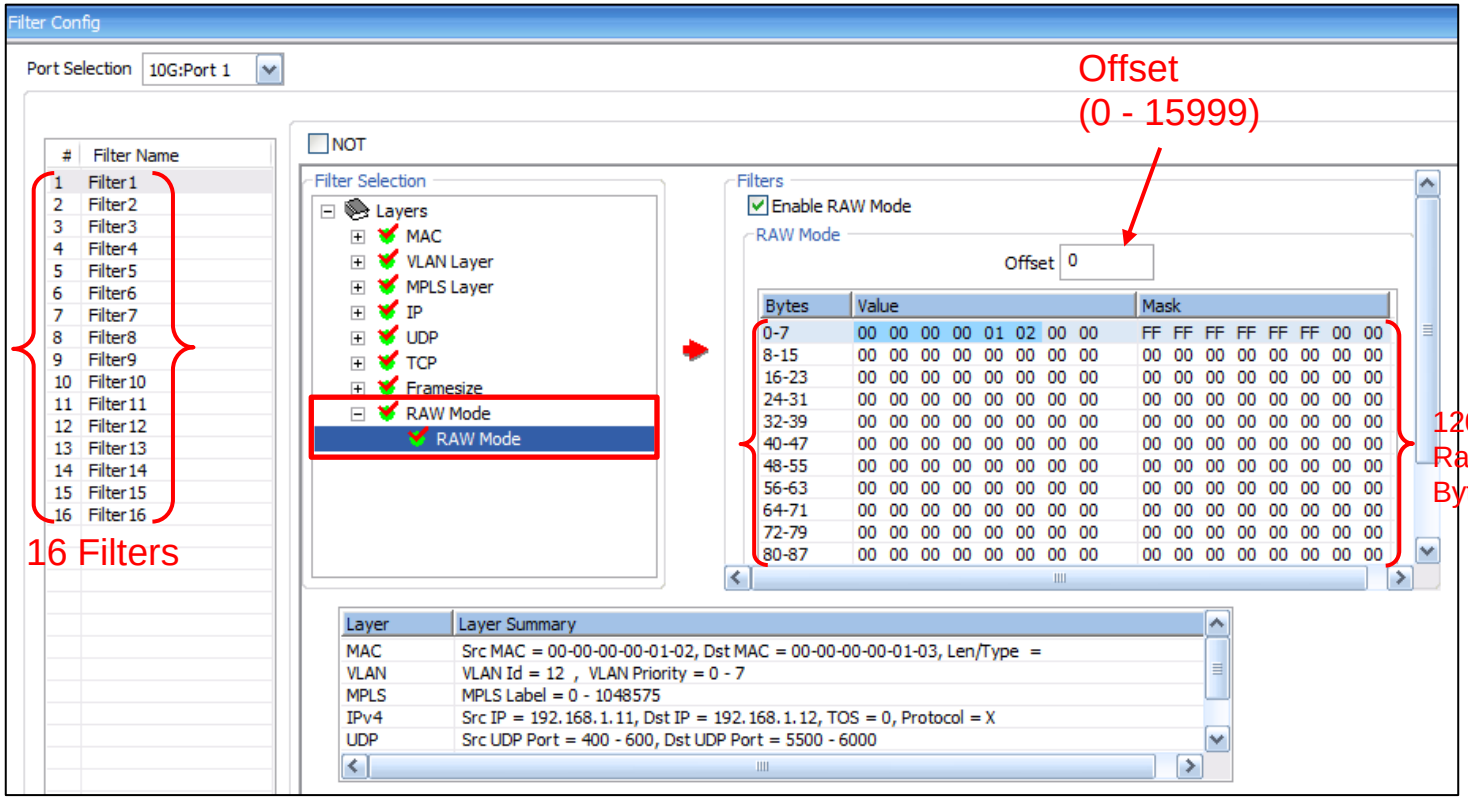
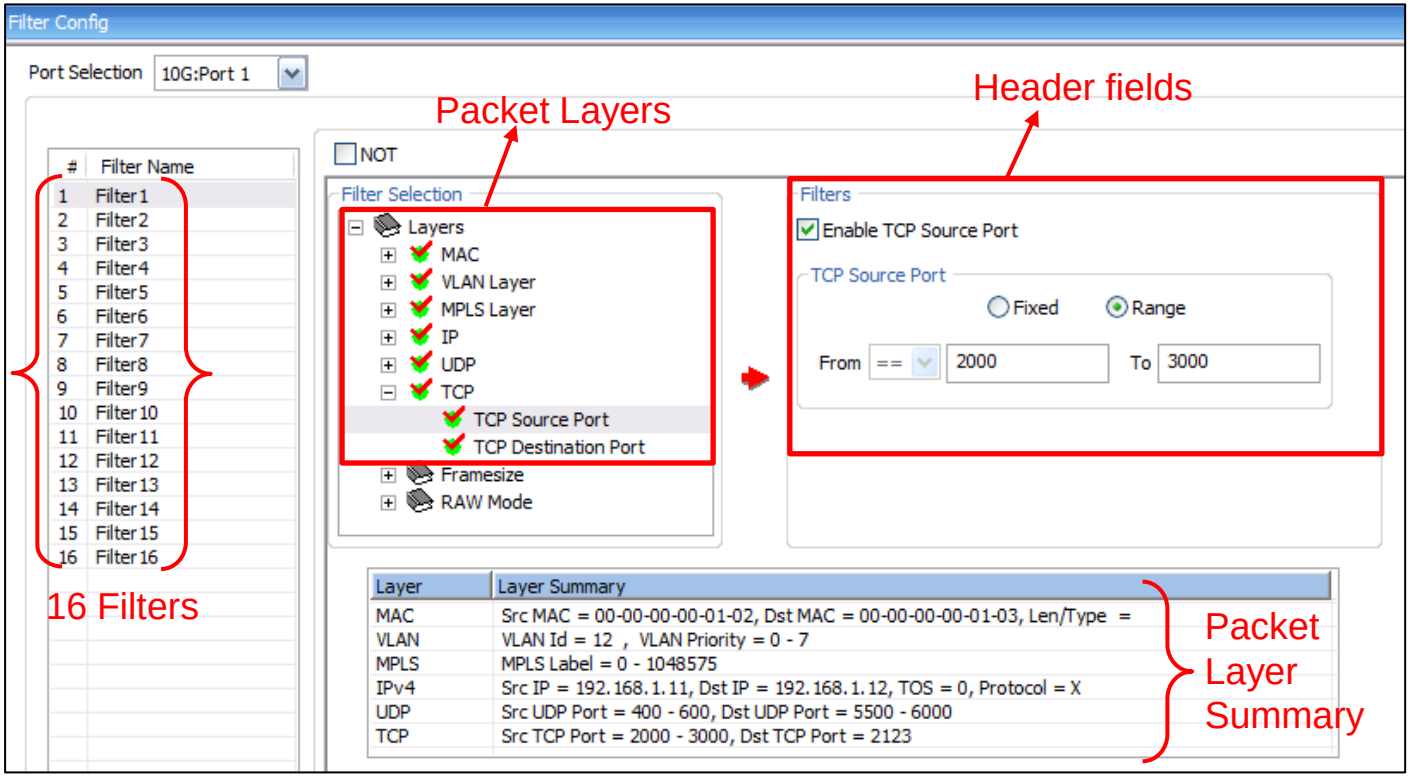
Filter Configuration

Raw Mode Filtering



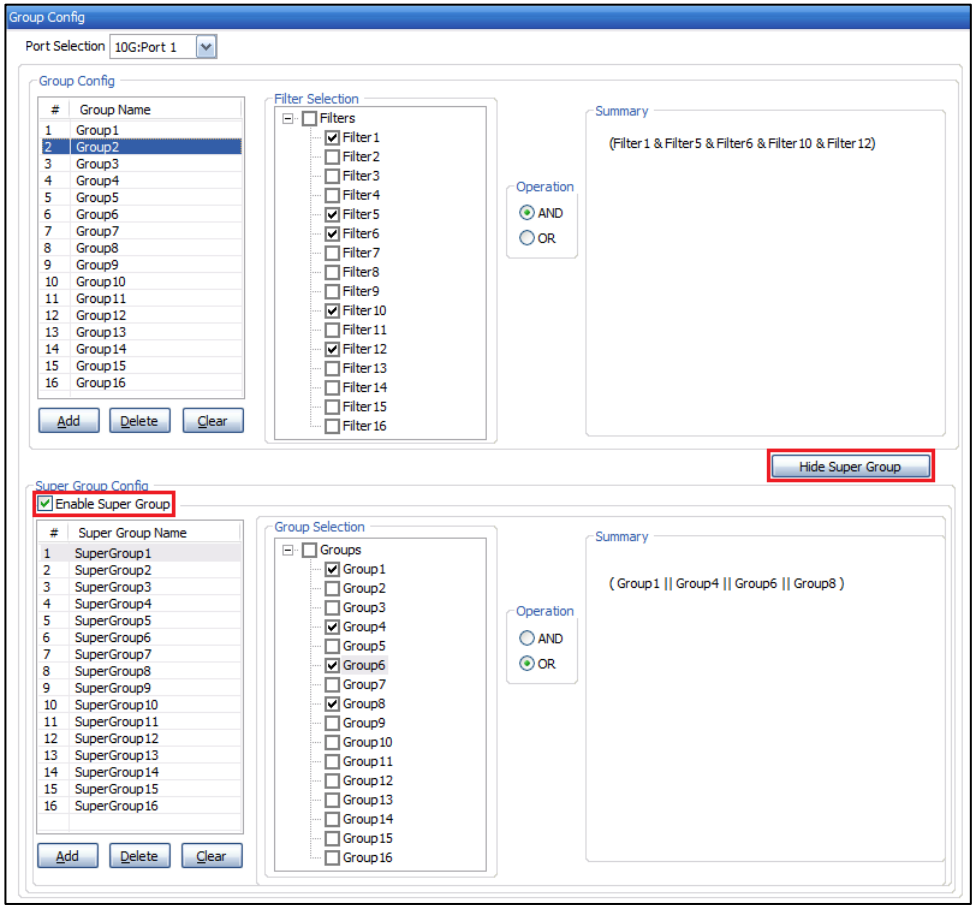
Filter Configuration (Contd.)

Packet Mode Filtering

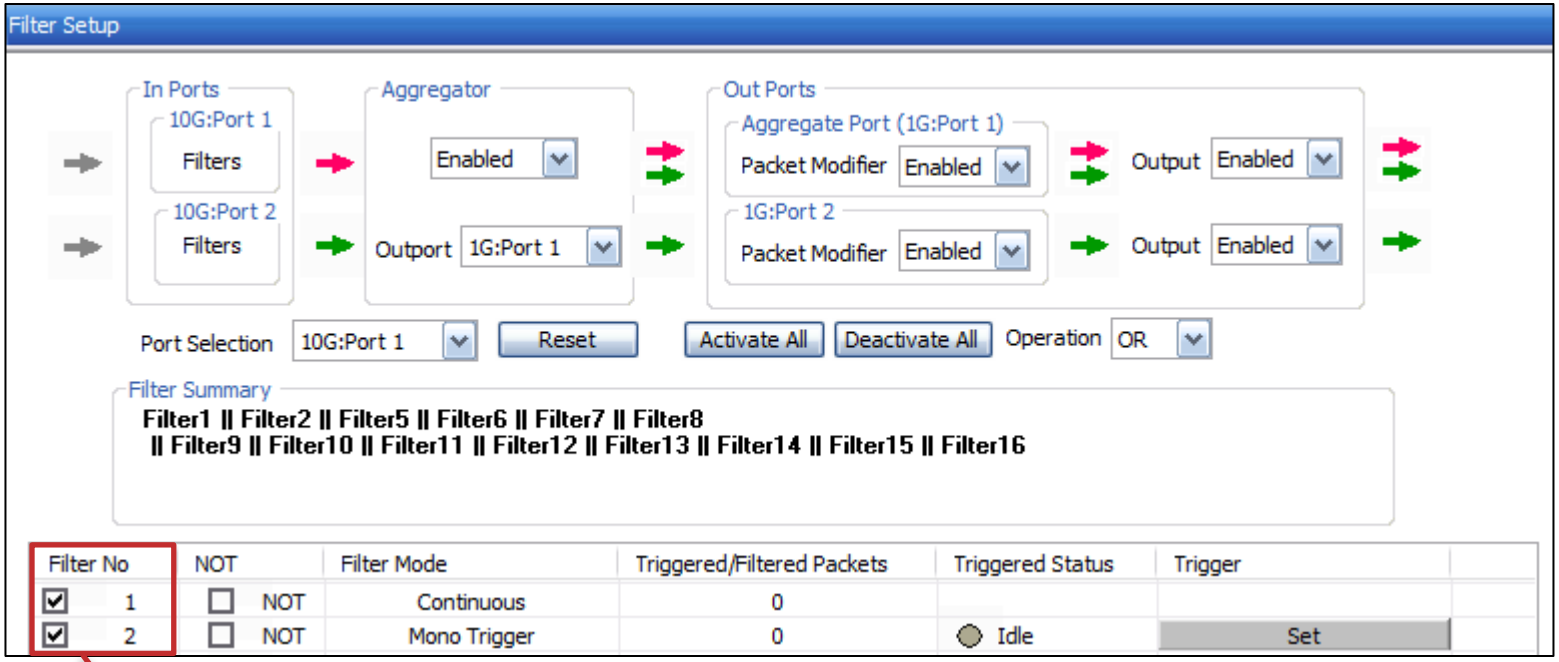


Group Mode Filter Configuration

- 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

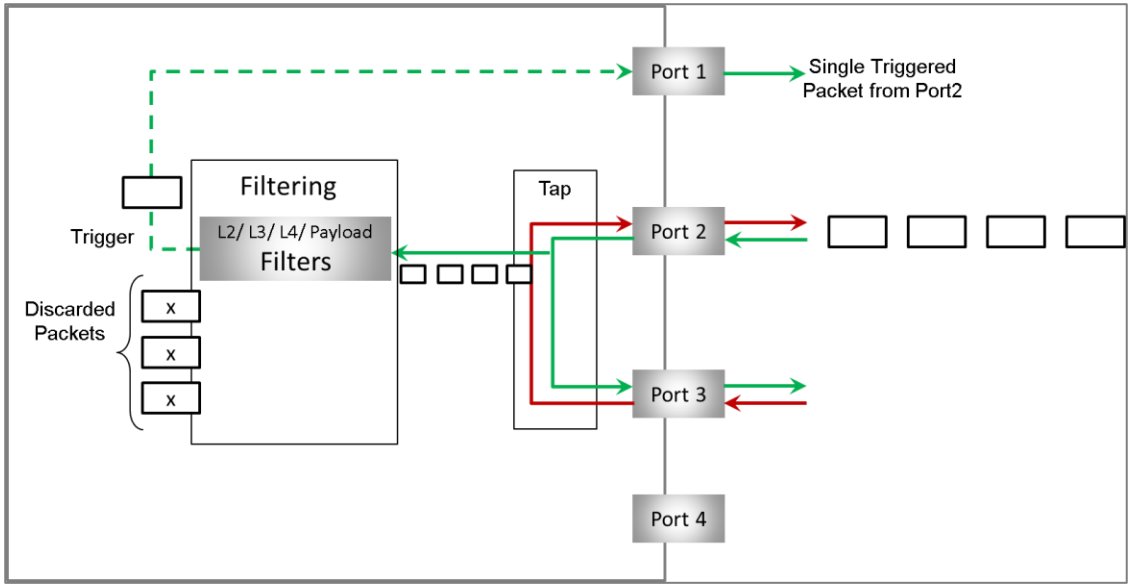


Dynamically Enable/Disable Filters



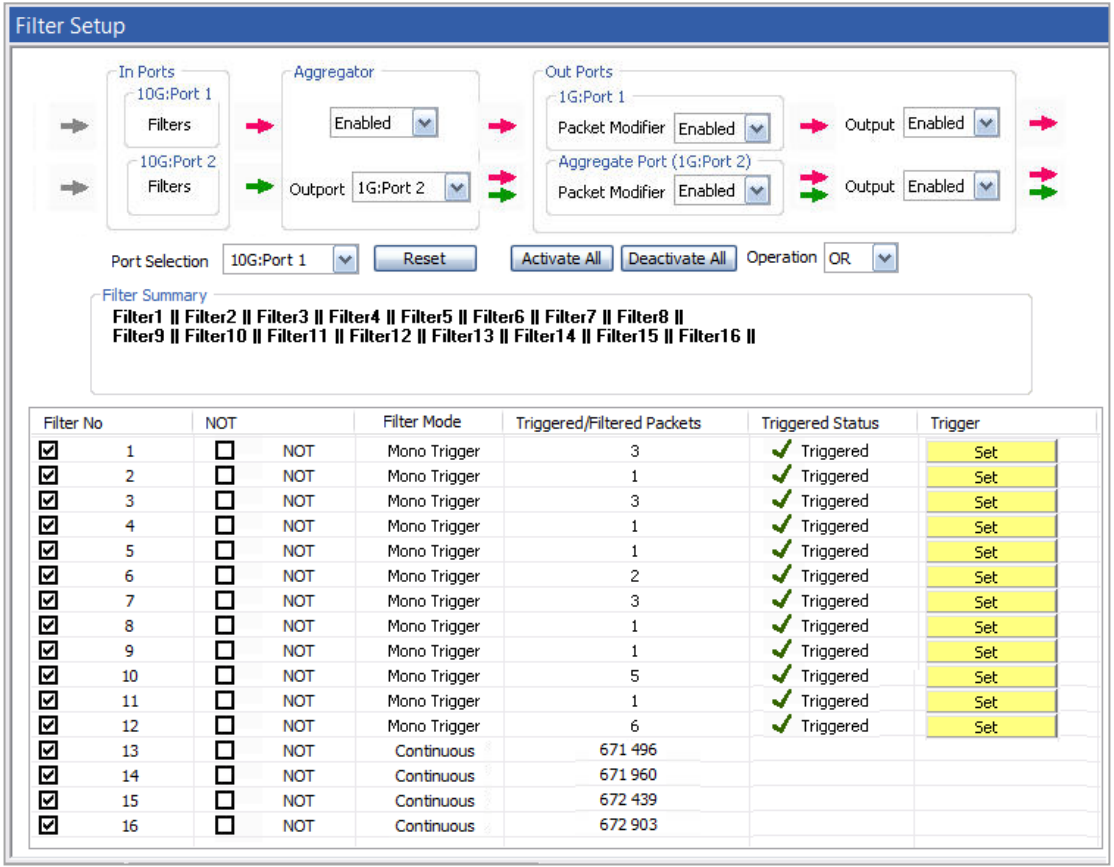
Dynamically Enable/Disable Filters, even at run-time

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 No	NOT	Filter Mode	Triggered/Filtered Packets	Triggered Status	Trigger
1	NOT	Mono Trigger	3	Triggered	Set
2	NOT	Mono Trigger	1	Triggered	Set
3	NOT	Mono Trigger	3	Triggered	Set
4	NOT	Mono Trigger	1	Triggered	Set
5	NOT	Mono Trigger	1	Triggered	Set
6	NOT	Mono Trigger	2	Triggered	Set
7	NOT	Mono Trigger	3	Triggered	Set
8	NOT	Mono Trigger	1	Triggered	Set
9	NOT	Mono Trigger	1	Triggered	Set
10	NOT	Mono Trigger	5	Triggered	Set
11	NOT	Mono Trigger	1	Triggered	Set
12	NOT	Mono Trigger	6	Triggered	Set
13	NOT	Continuous	671 496		
14	NOT	Continuous	671 960		
15	NOT	Continuous	672 439		
16	NOT	Continuous	672 903		

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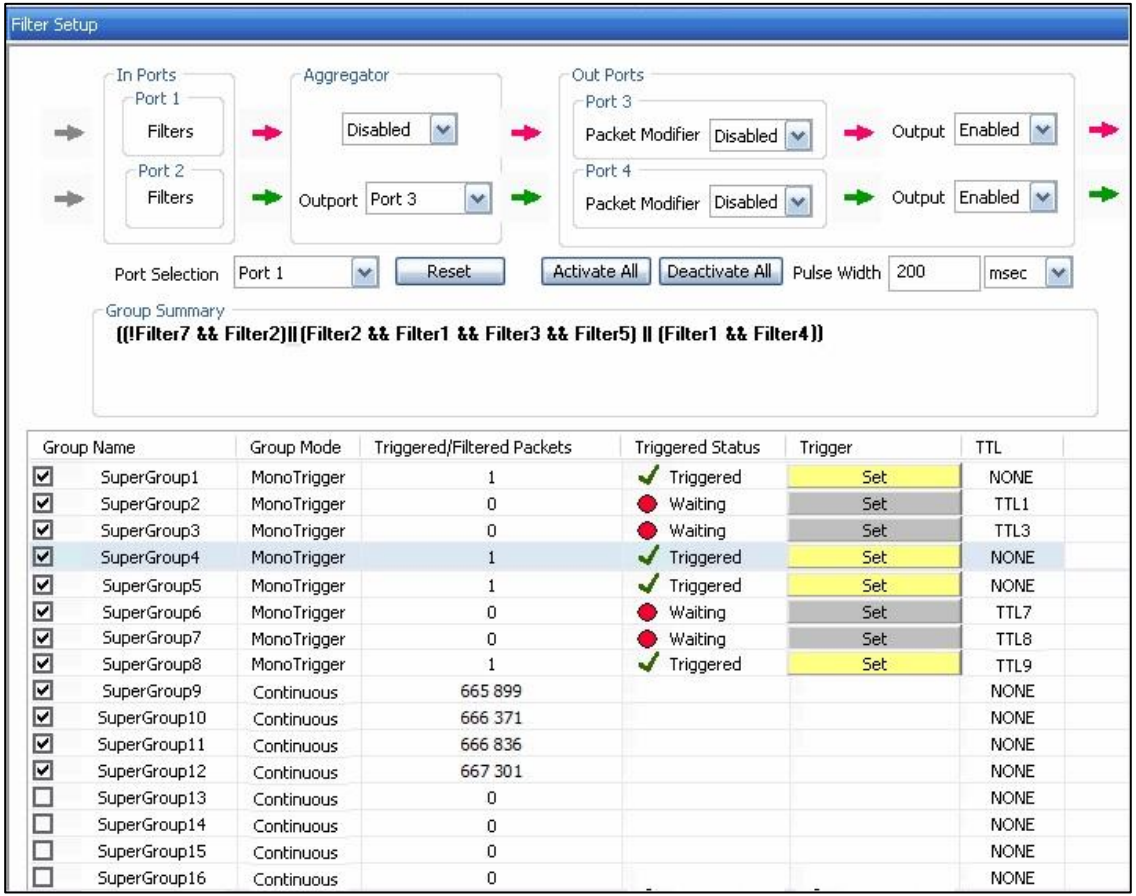
Filter Trigger Mode (Group mode)



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

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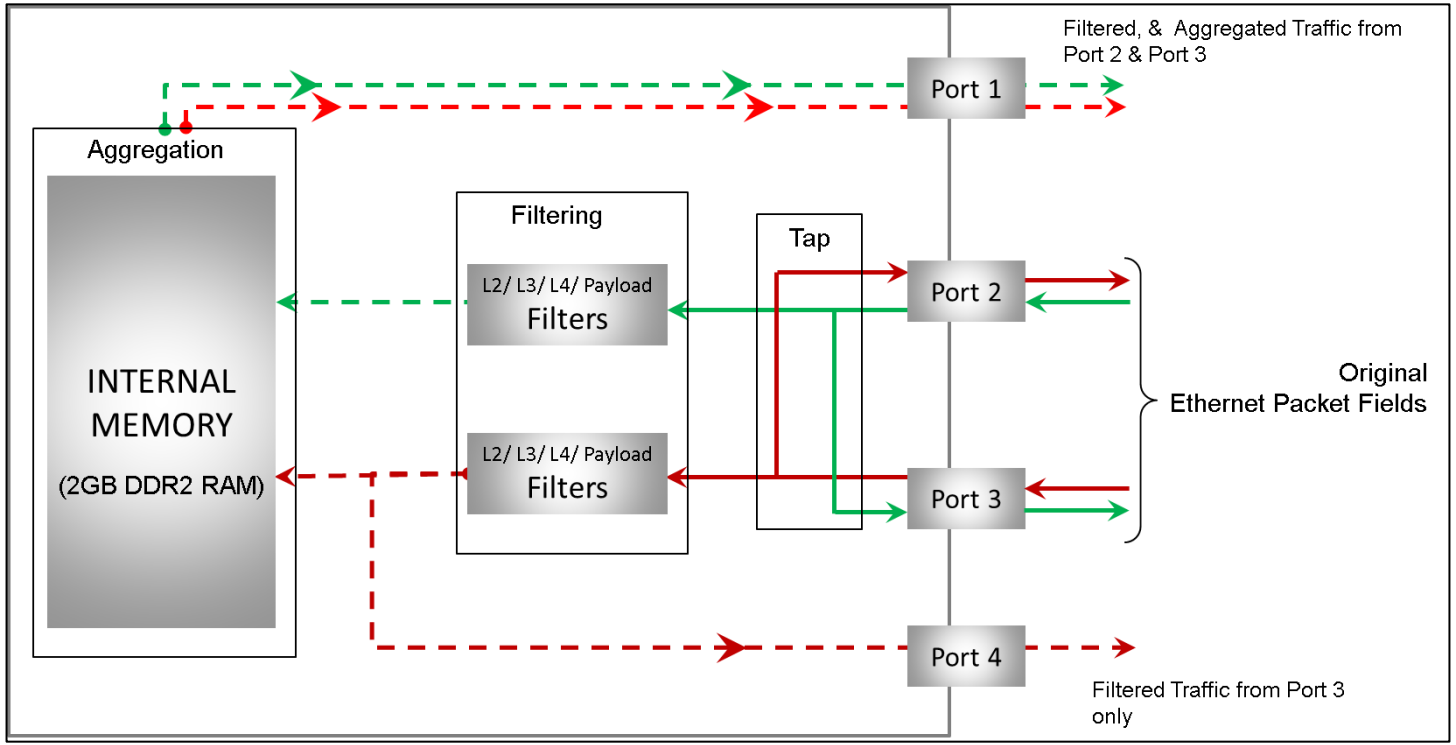
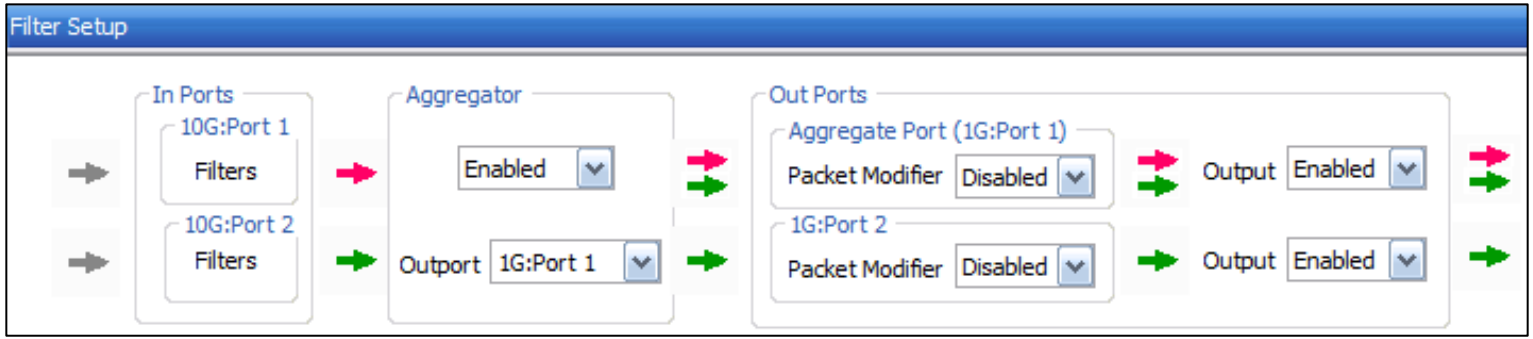
Packet Aggregation

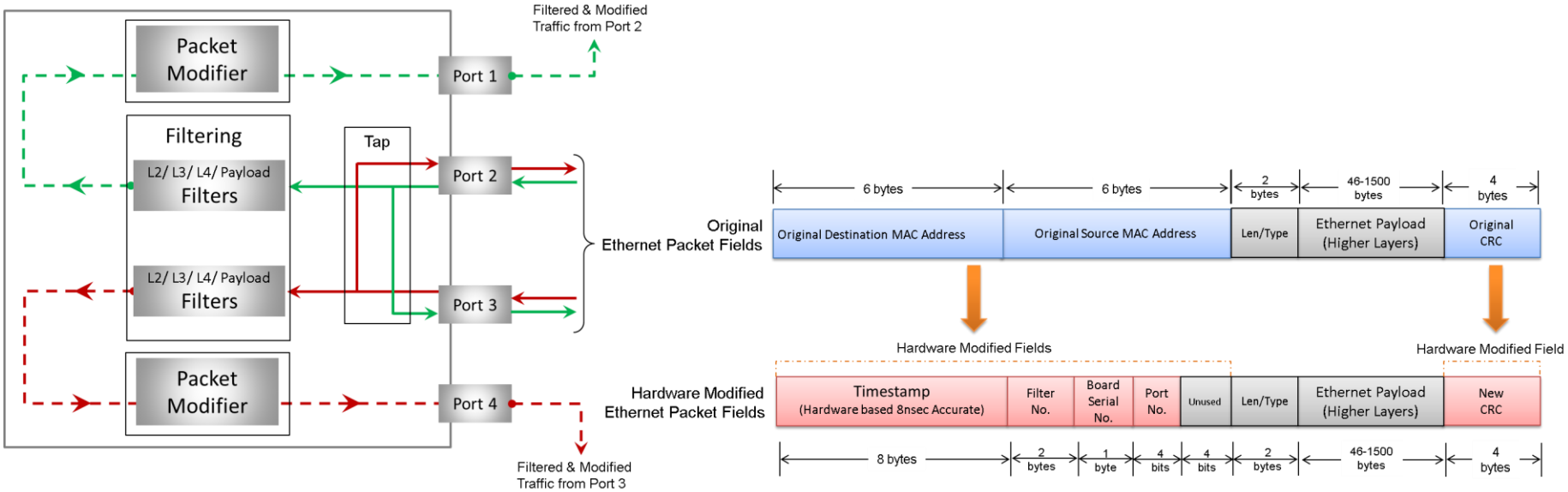


Packet Aggregation User Interface



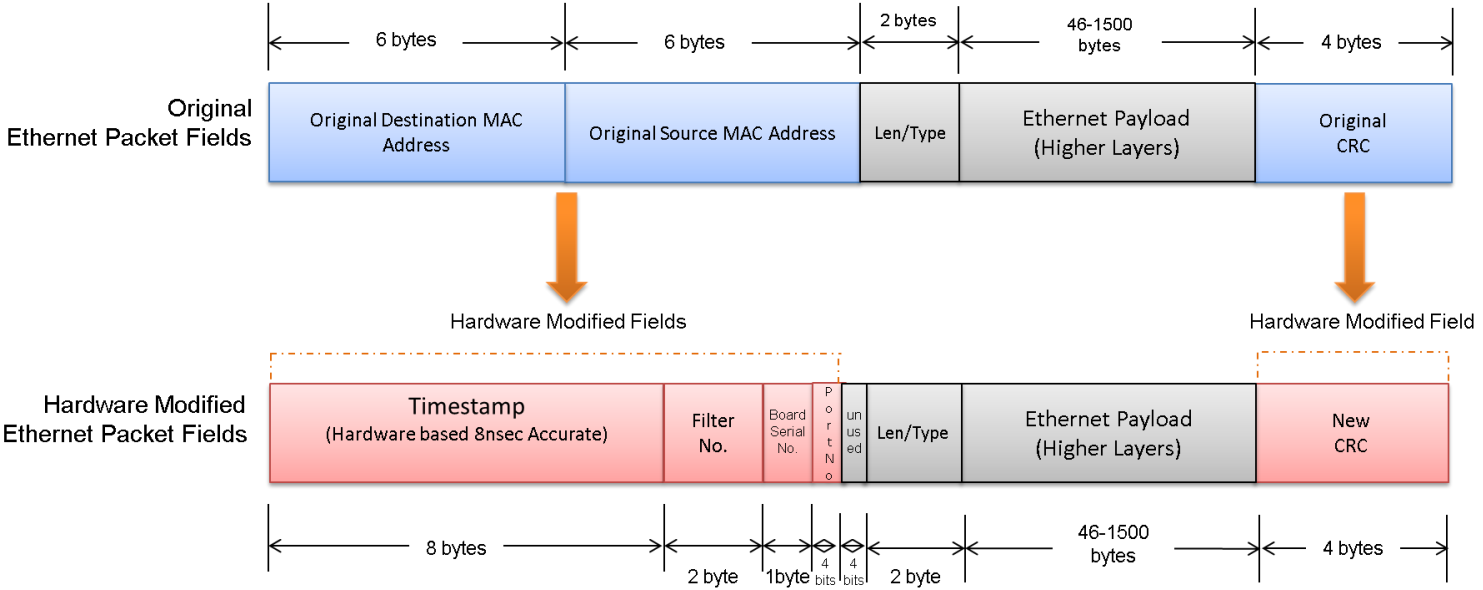
- The filtered traffic is combined and sent out through a single output port
- If the combined bandwidth exceeds the wirespeed of the output port, may cause packet loss
- Hence, the onboard memory (2 GB DR2 RAM) is used as a temporary buffer to store the traffic before sent out at wirespeed. Thus, upto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

Packet Modification



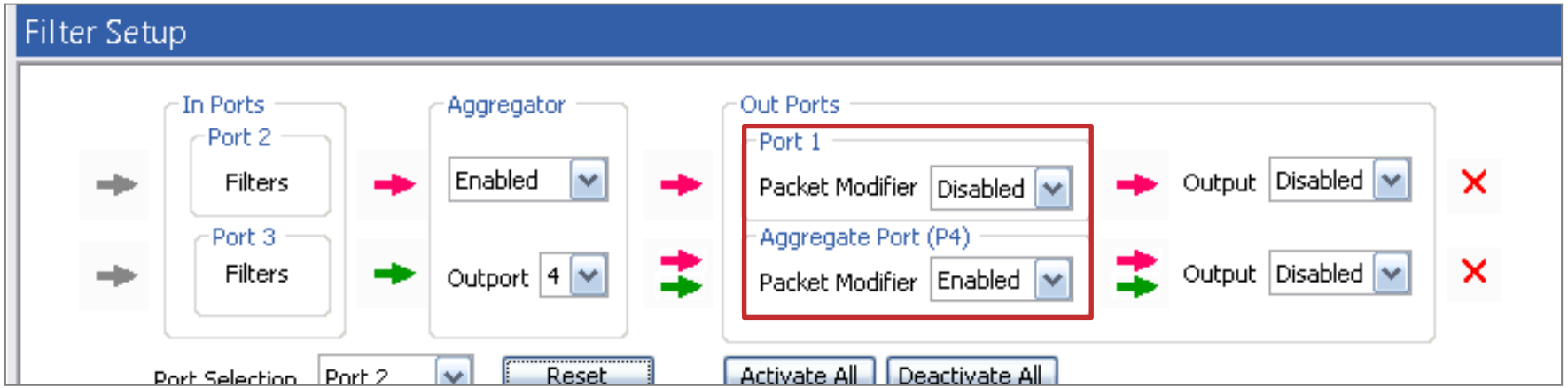
- Need to convey very useful information such as the timestamp, port number, filter number etc. to the analysis tool
- May not have the flexibility to convey it outband – may need to do it inband
- PacketBroker™ provides this functionality by conveying it in the MAC header of the output packets.

Packet Modification (Contd.)

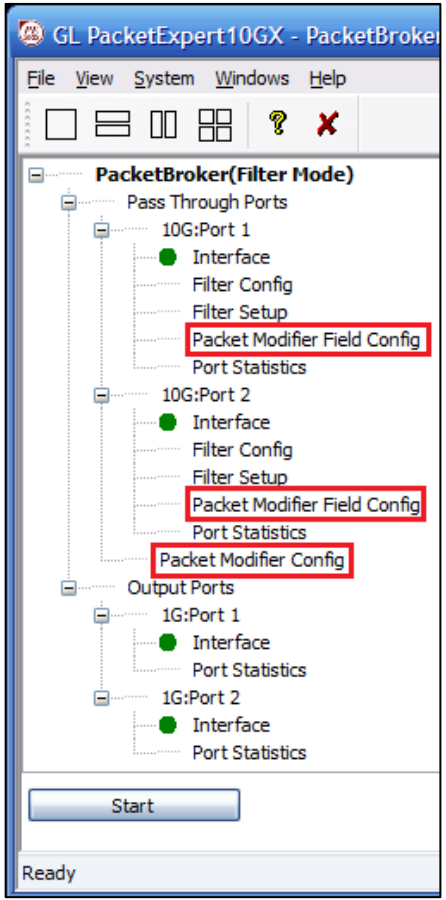


- Timestamp, Filter Number, Board Serial Number and Port Number fields are written on top of the Src MAC address and Dst MAC Address fields
- Ethernet CRC is recalculated
- Original MAC header will be lost, but many times, this may be fine if interest is only in higher layers (IP, TCP/UDP etc.)

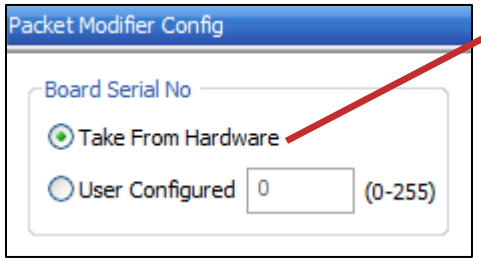
Packet Modifier Enable/Disable

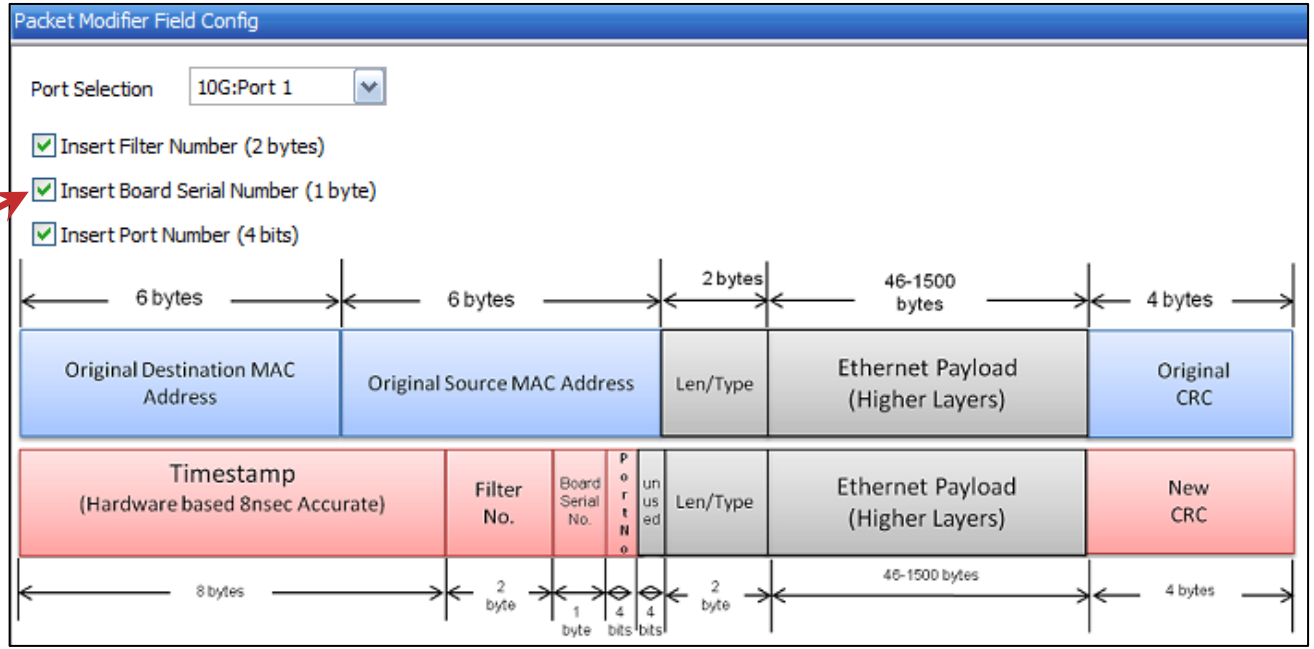


Packet Modifier Field Config Menu

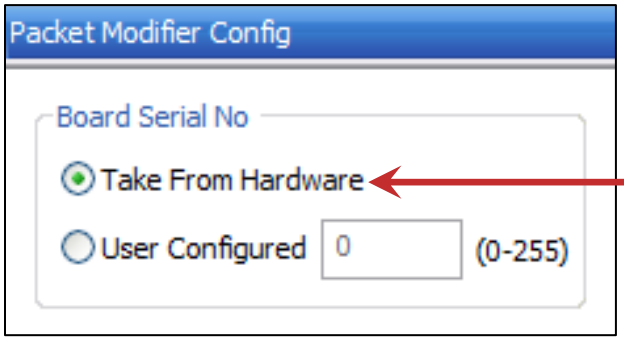


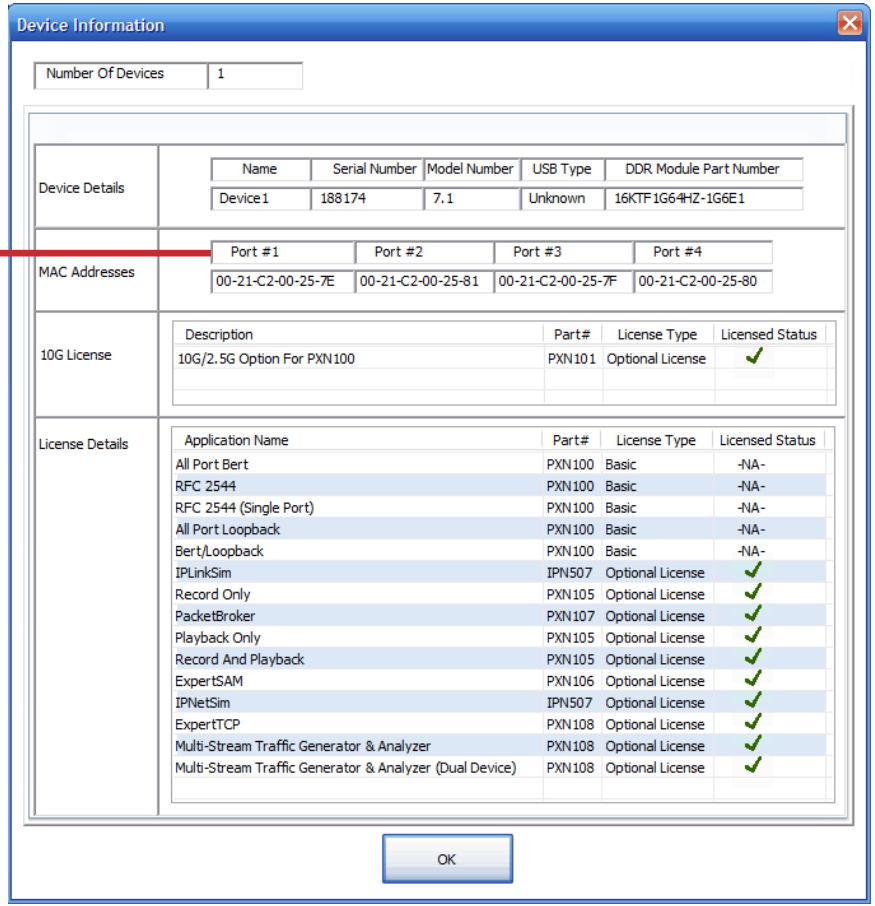
Packet Modifier Field Configuration



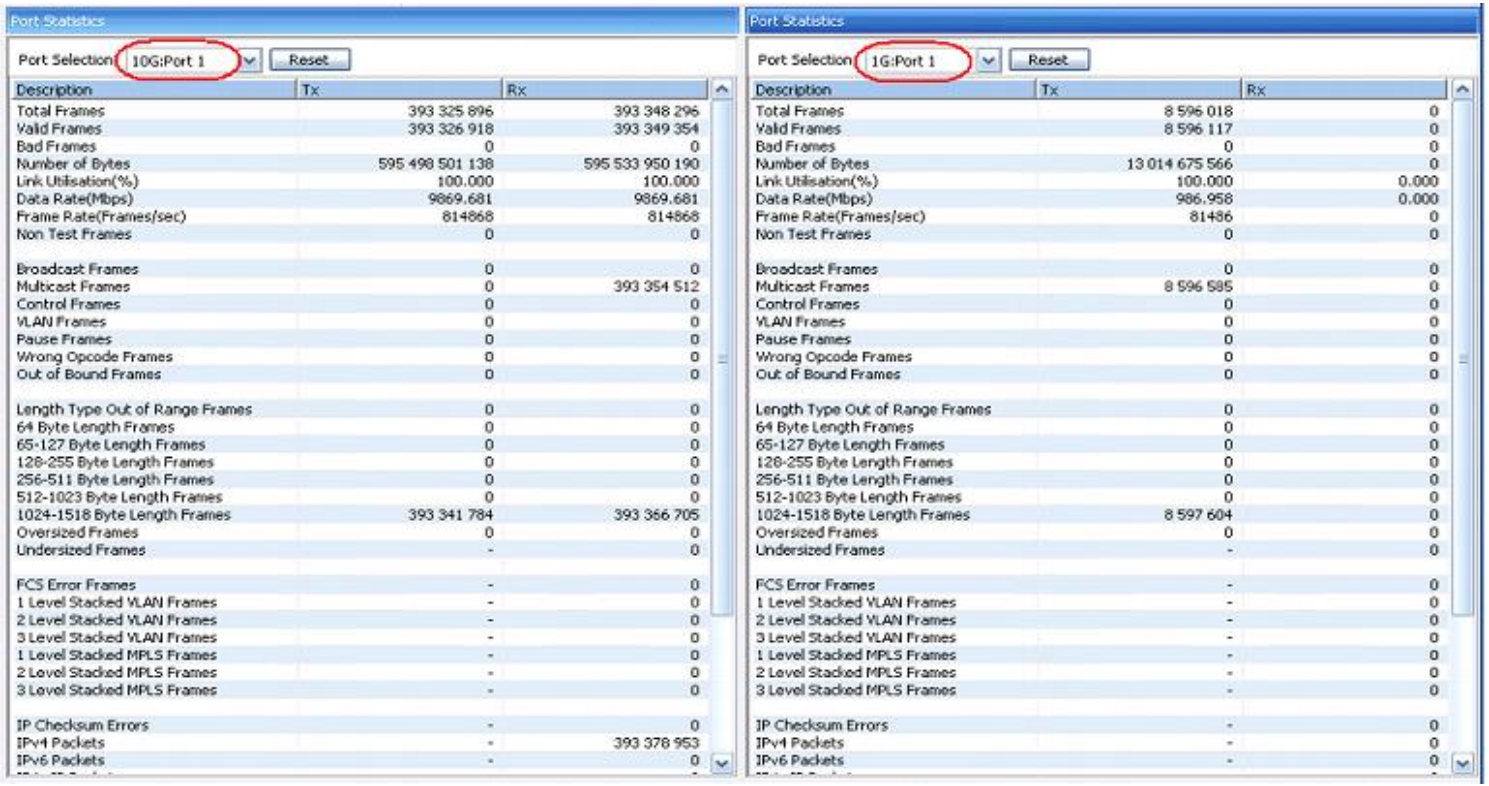


Packet Modifier Board Serial Number Config





Port Statistics



Port Statistics

Port Selection: 10G:Port 1 | Reset

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	-	393 378 953
IPv6 Packets	-	0

Port Statistics

Port Selection: 1G:Port 1 | Reset

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