
PacketExpert™ 100G: Comprehensive Ethernet and IP Test Solution

1 Gbps up to 100 Gbps



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Ethernet / IP Testing: Scope

- **What to test?**
 - Cables, switches, routers, gateways, VLAN, VPN, client to server, client to client, end-to-end networks
- **When to test? What frequency?**
 - Time of day, under high/low stress, after an infrastructure change, circuit handover, acceptance testing, benchmark testing
- **How to test?**
 - Bit errors, frame loss, throughput, latency, etc.
 - At different speeds, frame sizes, packet types

Real World Examples

(from Existing Customers)

- **Service Level Agreement (SLA) Verification**
 - Service Provider: During cutover or troubleshooting times
 - Customer: Verification that SLA is being met on mission critical circuits
- **Equipment Manufacturer Testing**
 - Development: Troubleshooting during R&D
 - Regression: Longer-term thorough testing that can be accurately repeated
 - Production: Validating that equipment is ready for shipment
- **Precision Delay Testing** - Packet traversing times through equipment or network
- **Test Bed (Lab) Applications**
 - Traffic Generators
 - Network Emulators

What Test Device is Needed?

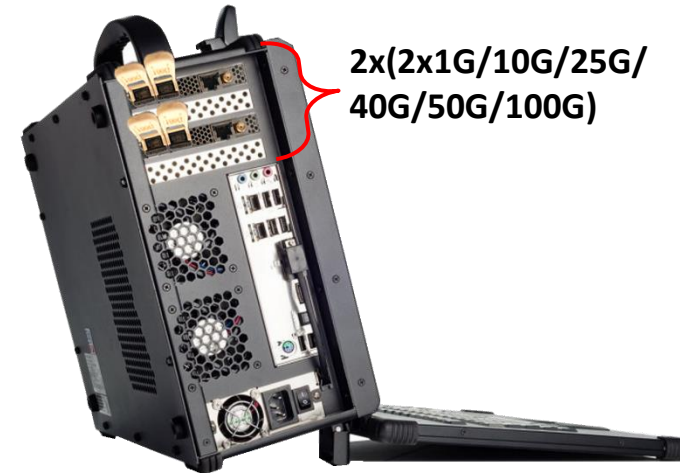
- Flexible (e.g., different interfaces: 1 Gbps, 10 Gbps, 25 Gbps, 40 Gbps, 50 Gbps, 100 Gbps)
- Multiuser capability
- Portable or stationary?
- Cover many tests: Bit error rates, RFC 2544, ITU-T Y.1564, Loopback
- Automation (run scripts!)
- Graphical user interface
- Cost effective

Hardware Specifications – Portable Platforms



2x1G/10G/25G/
40G/50G/100G

**Portable PacketExpert™ 100G
(Lunchbox)**



2x(2x1G/10G/25G/
40G/50G/100G)

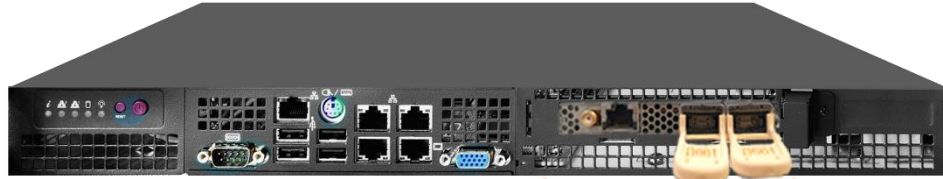
**Portable PacketExpert™ 100G
(Lunchbox)**



4x(2x1G/10G/25G/
40G/50G/100G)

**Portable PacketExpert™ 100G
(Lunchbox)**

Hardware Specifications – Rackmount Platforms



2x1G/10G/25G/40G/50G/100G

PacketExpert™ 100G – 1U Rack-mount PC



2x(2x1G/10G/25G/40G/50G/100G)

PacketExpert™ 100G – 2U Rack PC

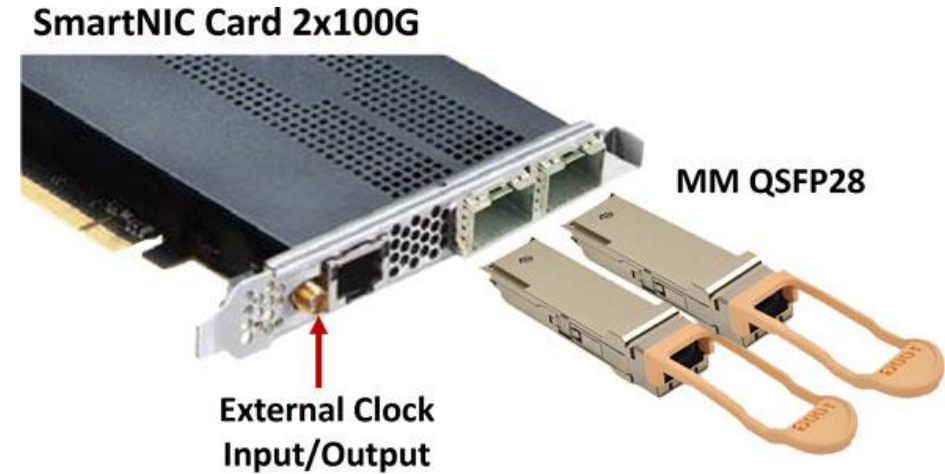


4x(2x1G/10G/25G/40G/50G/100G)

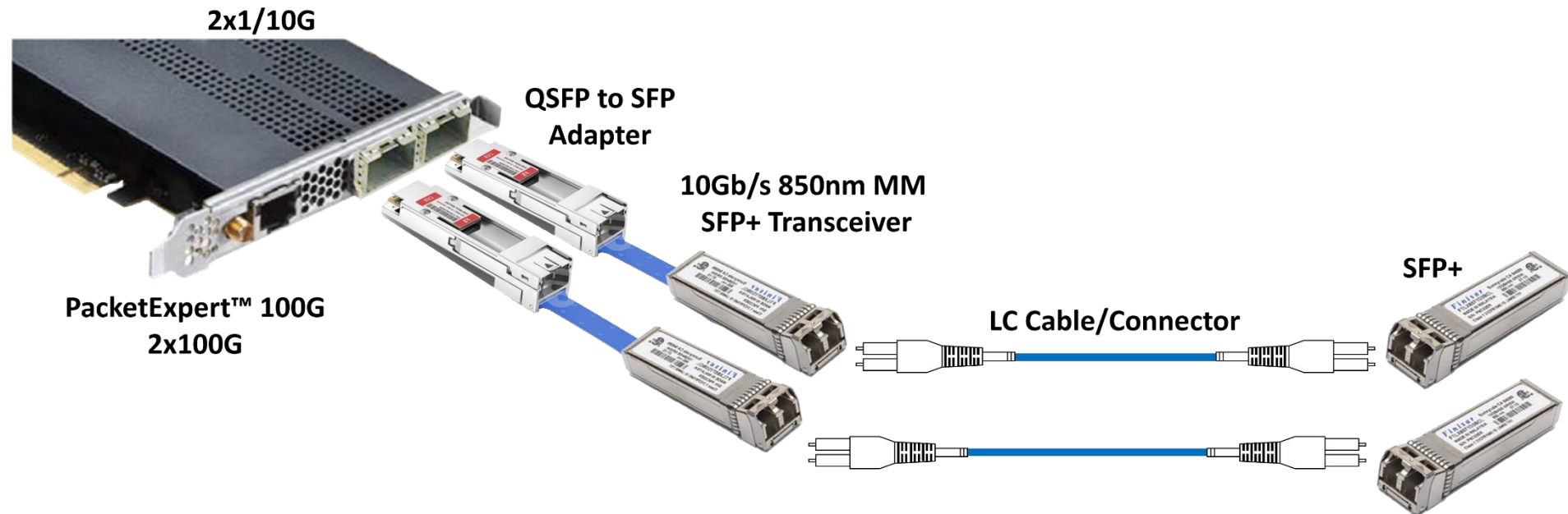
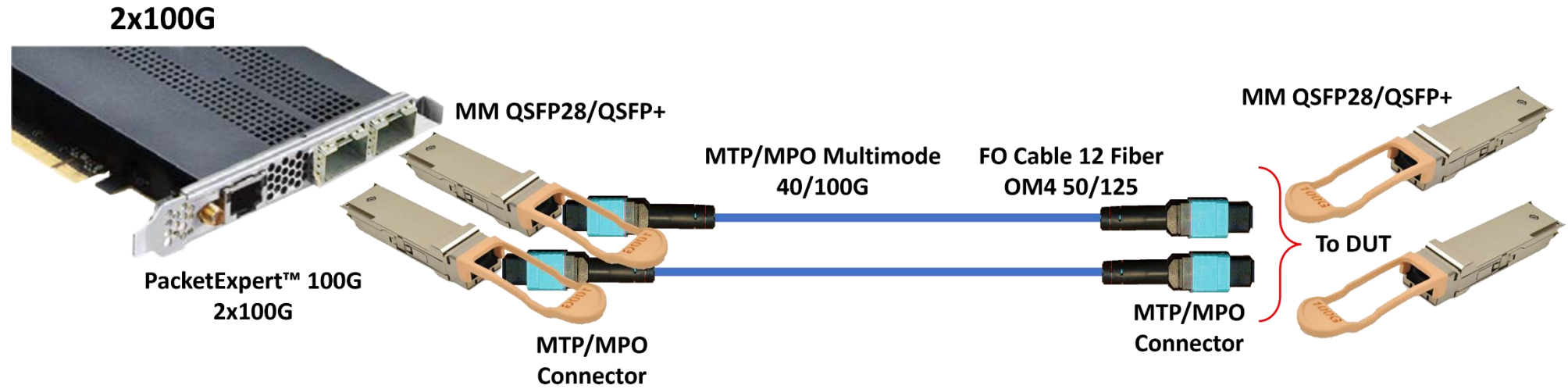
PacketExpert™ 100G – 4U Rack-mount PC

PacketExpert™ 100G - SmartNIC Specifications (Per Card)

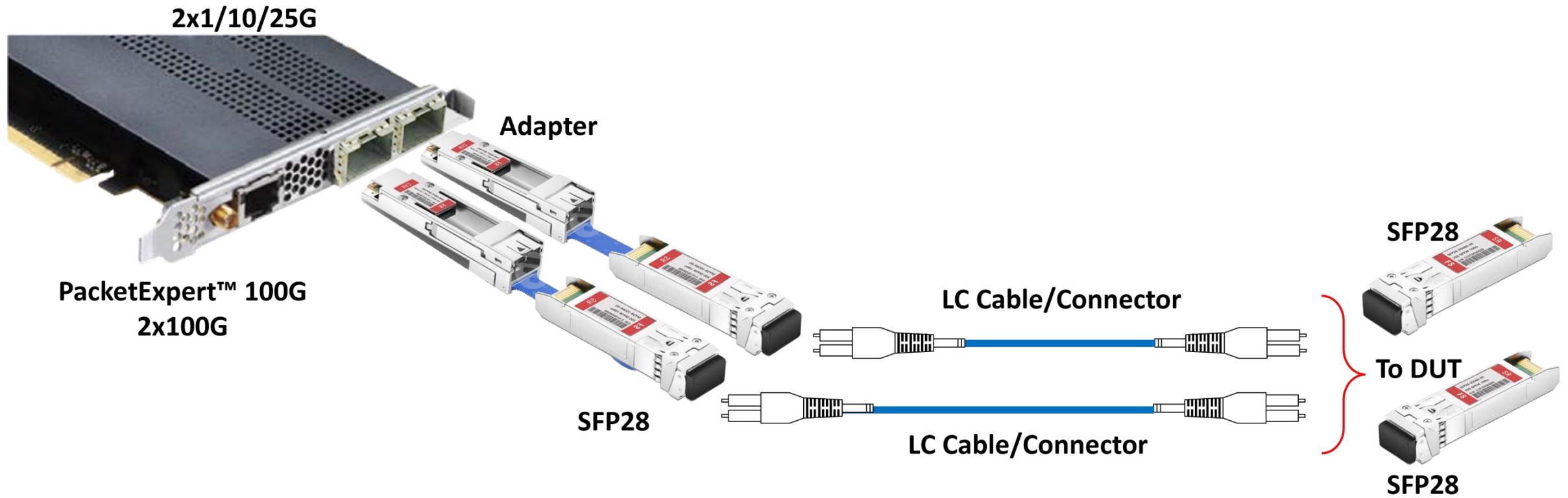
Optics	• 2 x QSFP28 cages for 2 x 100 GbE, 2 x 50GbE, and 2 x 40 GbE • Supports 2 x 25 GbE, 2 x 10 GbE, and 2 x 1 GbE with QSFP-to-SFP adapter
PCIe	PCIe Gen 3, 16 lanes
RAM	8 GBytes DDR4 SDRAM
1000Base-T Port	RJ45 for IEEE1588v2
Single-ended Coaxial I/O	SMA connector, 50 Ohms for External Clock Input/Output
Temperature Range	0 °C to 45 °C
Operating Humidity	20% to 80%
Storage	-10 to 60 °C
Oscillator Accuracy	+/- 4.6ppm



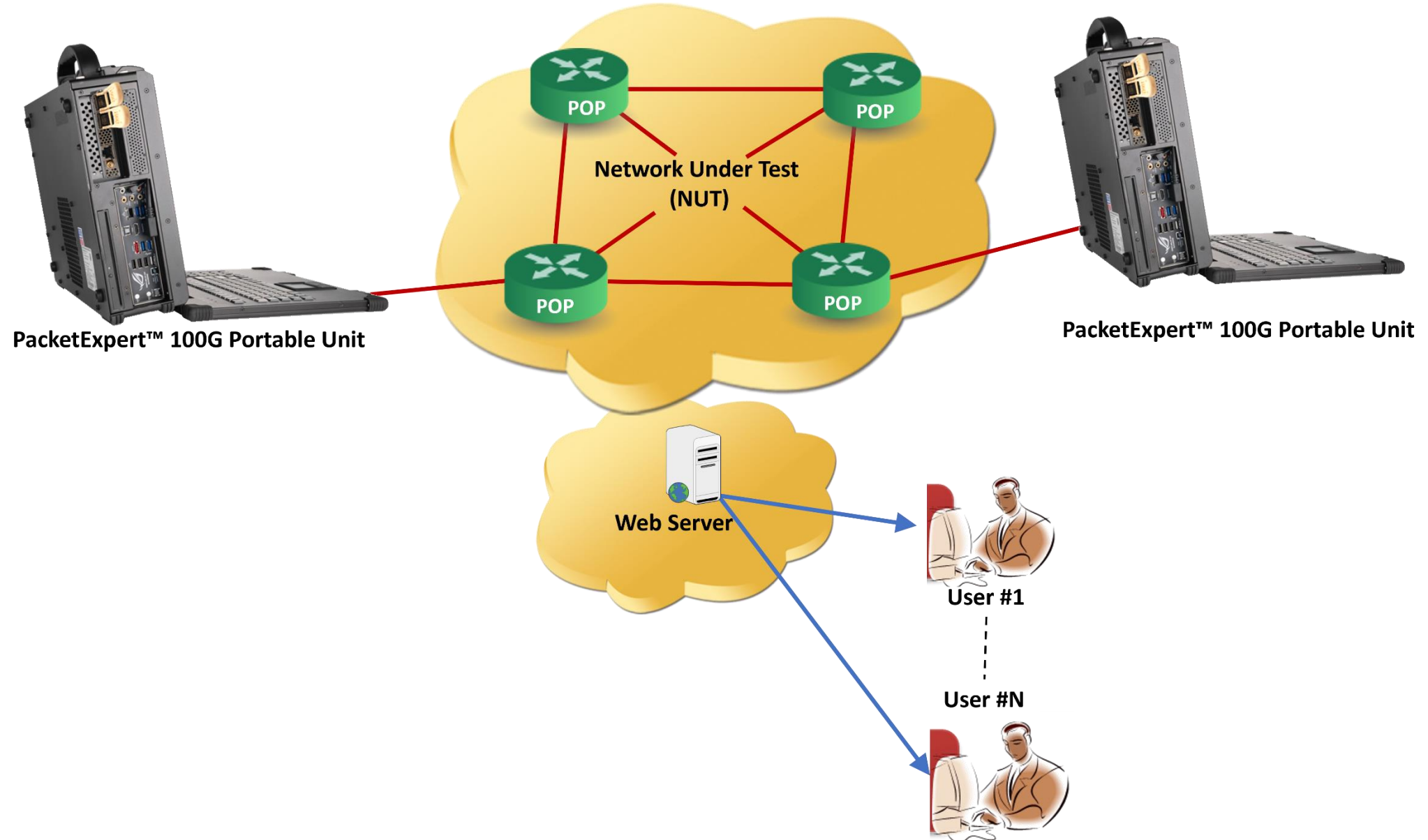
2x1/10, 2x40, 2x50, 2x100 Configuration



2x1/10/25G Configuration

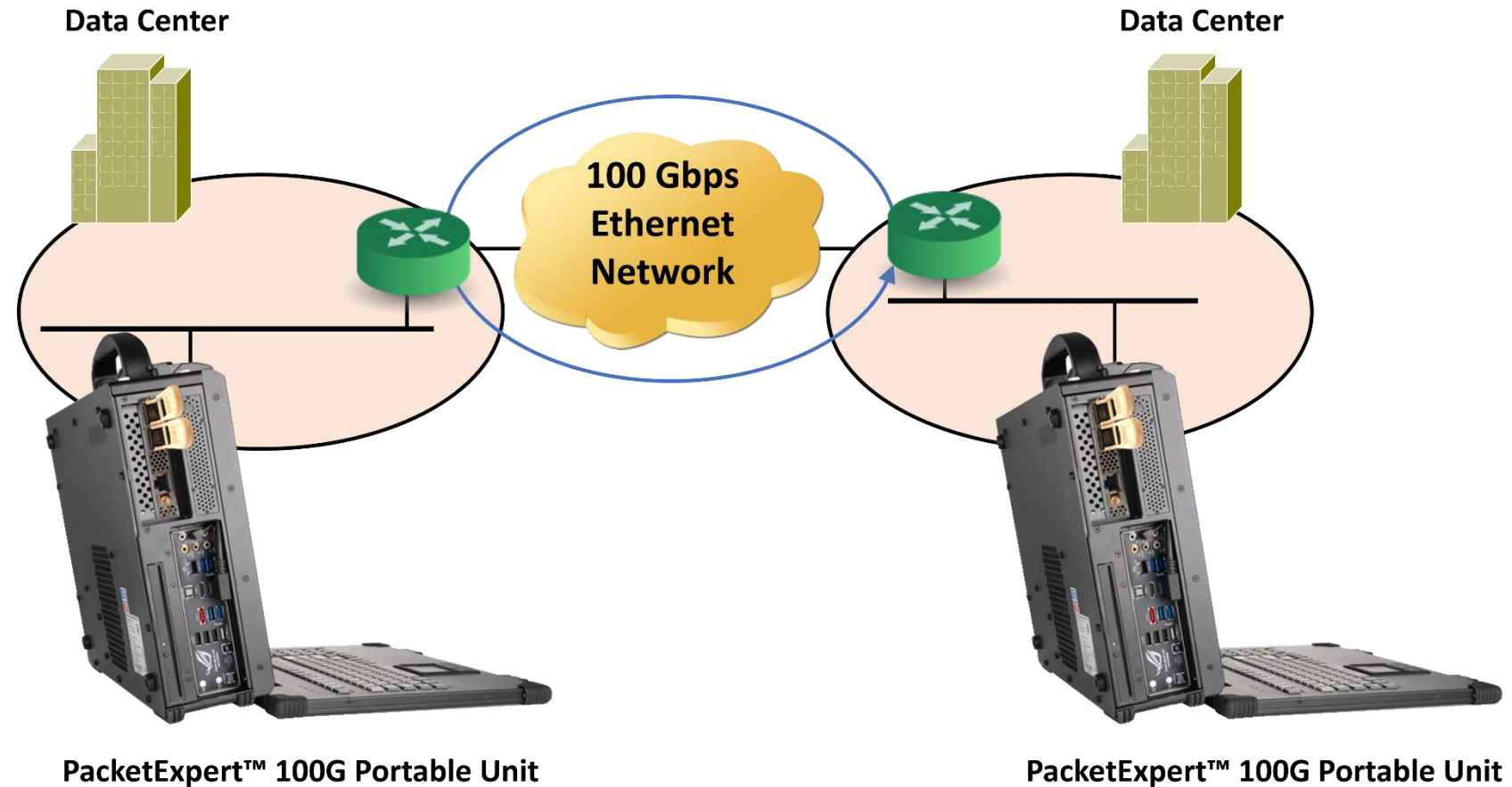


Network Diagram



Key Network Performance Challenges Solved by BERT

- Ensuring Signal Integrity
- Optimizing Channel Performance
- Guaranteeing System Reliability
- Maximizing Error Correction Effectiveness
- Rigorous Equipment Testing
- Proactive Network Maintenance and Efficient Troubleshooting
- Implementing Quality of Service (QoS)



PacketExpert™ 100G - BER Test Setup at Layer 3 / 4

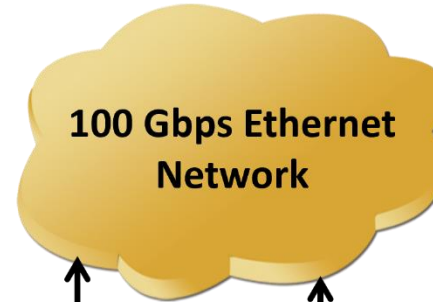
Layer 3 Testing between PacketExpert™ located in different IP Networks

PacketExpert™ 100G

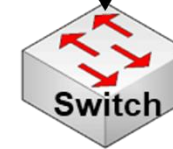


Network 1

Source IP address = 192.168.1.11 (Port 1)



100 Gbps Ethernet
Network



Network 2

PacketExpert™ 100G



Destination IP address = 192.168.2.12 (Port 1)

- BERT test can be performed on various link speed such as **1G, 10G, 25G, 40G, 50G or 100G**
- PacketExpert™ 100G can perform BERT across networks

BERT Features

- **Bit Error Rate Testing (BERT)** supports industry standard PRBS patterns – 2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, $2^{23}-1$, $2^{29}-1$, $2^{31}-1$, All Ones, All Zeroes, Alternate Ones and Zeroes, and User Defined pattern
- BERT is applicable for Ethernet (Layer 2), up to 3 Stacked VLAN (Q-in-Q), up to 3 Stacked MPLS (Layer 2.5), IPv4/IPv6 (Layer 3) and UDP (Layer 4)
- Intentionally introduce single bit errors individually or at a desired rate
- User-defined header parameters for MAC, VLAN, MPLS, IPv4/IPv6 and UDP layers
- Multi-device support for wire-speed BERT and simultaneous BERT/Loopback applications to increase the number of parallel BERT tests
- Real-time graphical representation of the combined Throughput and Bit Error rate can be plotted over time for BERT testing

BERT Configuration - Summary

PacketExpert™

Dashboard Servers Event Log Admin

Devices Ports **BERT**

Summary **Configuration** Statistics Graph All Ports Statistics Event Log

BERT Configuration ● Idle

Port2 ☒ Tx/Rx Coupled

Summary Layer MAC VLAN MPLS IP UDP BERT Traffic

Description	Tx/Rx
Layer	UDP
MAC	
Source MAC Address	00-0D-E9-08-D2-EC (HW MAC Address)
Destination MAC Address	00-0D-E9-08-D2-EB
Len/Type	88-47
VLAN	Enabled
VLAN #1 Type	81-00
VLAN #1 Id	0
VLAN #1 Priority	0
VLAN #2 Type	88-A8
VLAN #2 Id	0
VLAN #2 Priority	0
VLAN #3 Type	91-00
VLAN #3 Id	0
VLAN #3 Priority	0
MPLS	Enabled
MPLS #1 Label	111111
MPLS #1 CoS	1
MPLS #1 TTL	128
MPLS #2 Label	222222
MPLS #2 CoS	1
MPLS #2 TTL	128
MPLS #3 Label	333333
MPLS #3 CoS	1
MPLS #3 TTL	128
IP	
IP Selection	IPv4
Source IP Address	192.168.1.12
Destination IP Address	192.168.1.11
Default Gateway	192.168.1.1
Subnet Mask	255.255.255.0
TTL	128
ToS/DS	0
Protocol	17
Header Checksum	Auto
Identification	Auto
UDP	
Source UDP	1002
Destination UDP	1001
Checksum	Auto
BERT	
BERT Pattern	2*9-1
Invert Pattern	Disabled
Sequence Number	Enabled
Reverse Bits	Disabled
Process FCS Error Frames	Disabled
Threshold for Verdict (Pass/Fail)	Bit Error Rate (1.0E-14)

- Display BERT Summary for various packet configurations

BERT Summary

Devices Ports **BERT**

Load Save

Summary Configuration Statistics Graph All Ports Statistics Event Log

BERT Summary

Statistics ☒ View1 ☒ View2 ☒ Graph ▶ Start Selected ■ Stop Selected Reset Selected Report

☒ Port	Config	Start/Stop ☒ Tx & Rx	Link Status	Verdict	Rate (Mbps)		Rx Alarm	Pat Sync	Bit Errors	Traffic Status	Out Of Sequence	Error Duration	Sync Loss Count	Sync Loss Duration	Instantaneous Bit Error Rate	Total Bit Error Count	Bit Error Duration
					Tx	Rx											
☒ Port1	Loop Up			Pass	98,699.607	98,699.607	No Alarms					00:00:00	0	00:00:00	0.00	0	00:00:00
☒ Port2	Loop Up			Pass	98,699.607	98,699.607	No Alarms					00:00:00	0	00:00:00	0.00	0	00:00:00

Port	Tx Total Frames	Rx Total Frames	Non Test Frames	FCS Error Frames	IP Checksum Errors	UDP Checksum Errors	Tx Link Utilization (%)	Rx Link Utilization (%)	Tx Frame Rate (frames/sec)	Rx Frame Rate (frames/sec)
Port1	133,721,374	133,678,461	0	0	0	0	100.000	100.000	8,127,438	8,127,438
Port2	133,691,451	133,698,684	0	0	0	0	100.000	100.000	8,127,438	8,127,438

Port	VLAN Frames	MPLS Frames	IPv4 Packets	IPv6 Packets	UDP Packets	ICMP Packets
Port1	133,678,460	133,678,460	133,678,460	0	133,678,460	0
Port2	133,698,682	133,698,682	133,698,682	0	133,698,682	0

BERT Results

- Users can measure out of sequence packets and packet loss through optional sequence number insertion feature
- Provides detailed BERT statistics such as Bit Error Count, Bit Error Rate, Bit Error Seconds and more

The screenshot displays the PacketExpert™ BERT Results page. The interface includes a top navigation bar with 'Dashboard', 'Servers', 'Event Log', and 'Admin'. Below this, a sub-navigation bar shows 'Devices', 'Ports', and 'BERT' (selected). The 'BERT' section has tabs for 'Summary', 'Configuration', 'Statistics' (selected), 'Graph', 'All Ports Statistics', and 'Event Log'. A 'BERT Statistics' section shows 'No Alarms' with a green dot. Below this are two buttons: 'BERT Results' and 'Port Statistics'. The main content area contains three tables: 'Alarms', 'Test Duration', and 'Frames Statistics'. The 'Alarms' table lists various error types with green status indicators. The 'Test Duration' table shows total, error, and error-free durations. The 'Frames Statistics' table shows the number of test and non-test frames. Additionally, there is a 'Rx BERT Statistics' table showing bit error rate and count for instantaneous and total measurements.

Alarms

	Alarms	Count	Duration
Bit Errors	●	0	00:00:00
Pat Sync	●	0	00:00:00
Out Of Sequence	●	0	00:00:00
Traffic Status	●	-	00:00:00
Link Status	●	-	00:00:00

Test Duration

	Duration
Total Duration	00:00:26
Error Duration	00:00:00
Error Free Duration	00:00:26

Frames Statistics

	Rx
Test Frames	193,210,537
Non Test Frames	0

Rx BERT Statistics

	Bit Error Rate	Bit Error Count	Bits Received
Instantaneous	0.00	0	94,668,409,472
Total	0.00	0	2,250,516,334,976

Port Statistics

Devices Ports **BERT** Load Save

Summary Configuration **Statistics** Graph All Ports Statistics Event Log

BERT Statistics ● No Alarms

BERT Results Port Statistics ⚙️

Port2 Reset

Common Statistics

Description	Tx	Rx
Link Utilization (%)	100.000	100.000
Data Rate (Mbps)	98,699.607	98,699.607
Bad Frames	0	0
Non Test Frames	-	0
FCS Error Frames	-	0
IP Checksum Errors	-	0
UDP Checksum Errors	-	0
Total Frames	697,248,872	697,270,267
Valid Frames	697,248,872	697,270,267
Number Of Bytes	1,058,423,787,696	1,058,456,265,306
Frame Rate (frames/sec)	8,127,438	8,127,438

VLAN Statistics

Description	Rx
1 Level Stacked VLAN Frames	0
2 Level Stacked VLAN Frames	0
3 Level Stacked VLAN Frames	0

MPLS Statistics

Description	
1 Level Stacked MPLS Frames	
2 Level Stacked MPLS Frames	
3 Level Stacked MPLS Frames	

Packet Type Statistics

Description	Tx	Rx
Broadcast Frames	0	0
Multicast Frames	0	0
Control Frames	0	0
VLAN Frames	0	0
Pause Frames	0	0

Length Statistics

Description	Tx	Rx
Undersized Frames	0	0
64 Bytes Length	0	0
65-127 Byte Length	0	0
128-255 Byte Length	0	0
256-511 Bytes Length	0	0
512-1023 Bytes Length	0	0
1024-1518 Byte Length	1,331,189,054	1,331,210,449
Oversized Frames	0	0

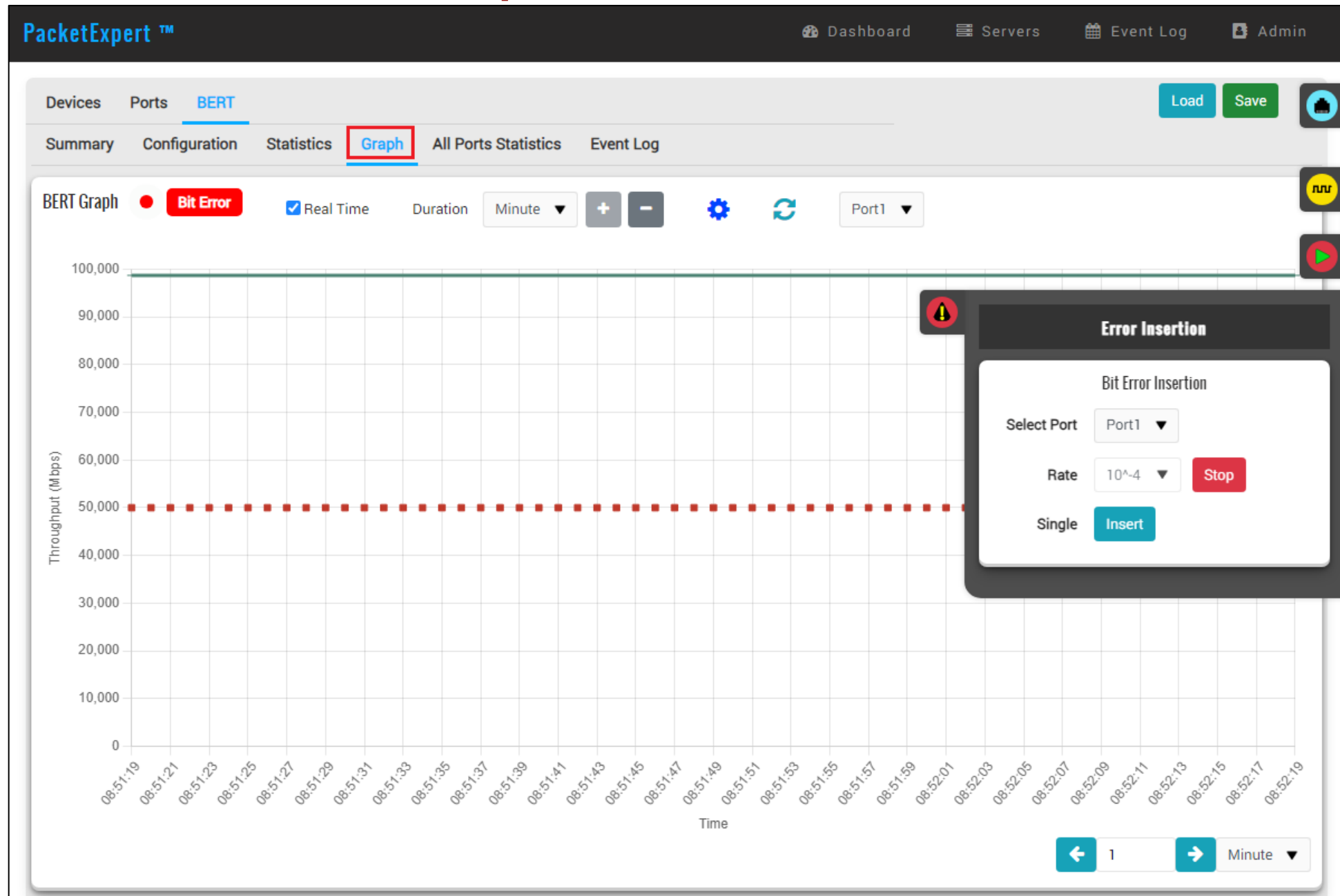
IP Statistics

Description	Rx
IP Checksum Errors	0
IPv4 Packets	1,331,210,447
IPv6 Packets	0
TCP Packets	0
ICMP Packets	0
IGMP Packets	0
IGRP Packets	0
Other Protocol IP Packets	0

UDP Statistics

Description	Rx
UDP Checksum Errors	0
UDP Packets	1,331,210,447

BERT Graph with Bit Error Insertion

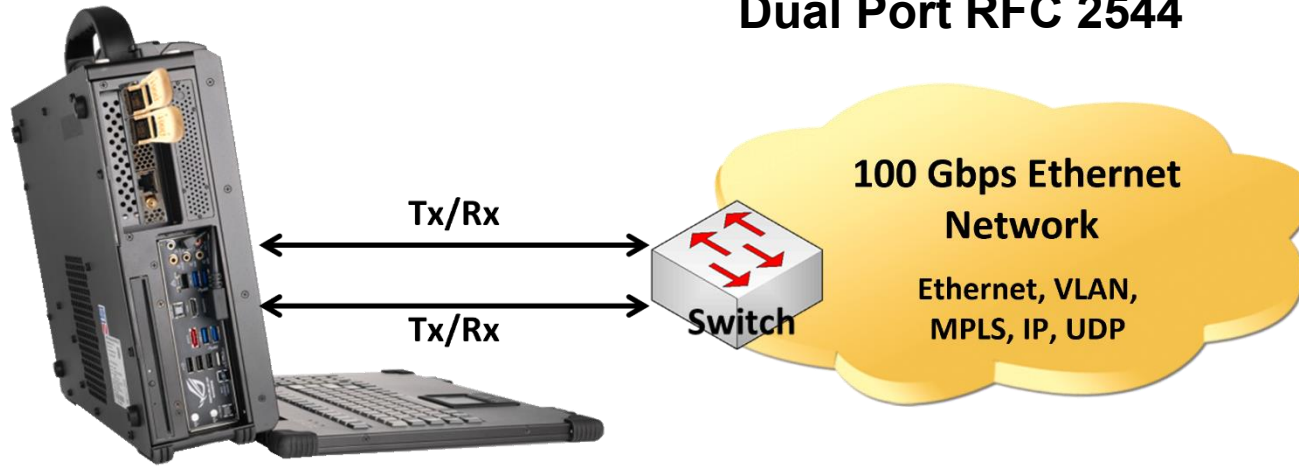


RFC2544 Testing: Benchmarking and Evaluating Network Device Performance

- Performance benchmarking
- Understanding the device capacity & limitations
- Ensuring the Quality of Service (QoS)
- Network capacity planning & upgrades
- Evaluating the reliability and robustness of the device
- Vendor Comparisons and SLA Verification
- Troubleshooting and Maintenance

RFC 2544 Testing

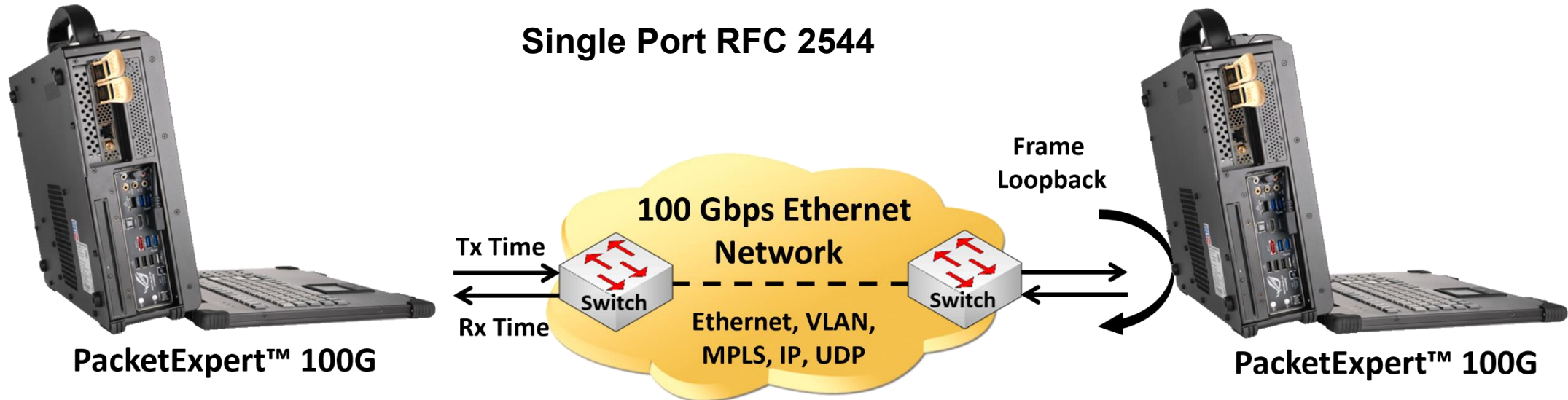
Dual Port RFC 2544



PacketExpert™ 100G

- Performs Throughput, Latency, Frame Loss and Back-to-Back tests at 1G, 10G, 25G and 100G link speed with web-based user interface

Single Port RFC 2544



PacketExpert™ 100G

PacketExpert™ 100G

(Latency = Rx Time – Tx Time)

RFC 2544 Features

- RFC 2544 can be tested on Ethernet, VLAN, MPLS, IPv4 / IPv6 and UDP layers
- Supports Throughput, Latency, Frame Loss, and Back-to-Back performance tests
- Uni-directional and bi-directional RFC 2544 testing supported
- User-defined configuration parameters such as frame size, trial duration, number of trials, etc.
- User selectable single or dual ports RFC 2544 testing
- Multi-device support for multiple parallel RFC 2544 tests
- Graphs and Statistics for all the RFC 2544 tests

RFC 2544 Configuration Summary

PacketExpert™

Dashboard Servers Event Log Admin

Devices Ports **RFC 2544** Load Save

Summary **RFC 2544 Configuration** Port Configuration Results Port Statistics Event Log

RFC 2544 Configuration ● Idle

Port1

Summary Global Configuration Test Configuration

Direction: East To East
Framesizes: [64, 128, 256, 512, 1024, 1280, 1518]

Throughput: ✓

Description	Value
Trial Duration (sec)	10
Number Of Trials	1
Acceptable Frame Loss	0
Resolution (%)	2.5
Bandwidth (%)	East ↻
Min	10
Max	100

Latency: ✓

Description	Value
Trial Duration (sec)	10
Number Of Trials	1
Description	East ↻
Bandwidth (%)	100
Use Throughput Value	Enabled

FrameLoss: ✓

Description	Value
Trial Duration (sec)	10
Number Of Trials	1
Rate (%)	East ↻
Start	100
End	10
Step Size	10

BackToBack: ✓

Description	Value
Number Of Trials	1
Acceptable Frame Loss (%)	0
Resolution (frames)	1
Burst Size (sec)	East ↻
Min	2
Max	10

RFC 2544 Port Configuration Summary

PacketExpert™

Dashboard Servers Event Log Admin

Devices Ports **RFC 2544** Load Save

Summary RFC 2544 Configuration **Port Configuration** Results Port Statistics Event Log

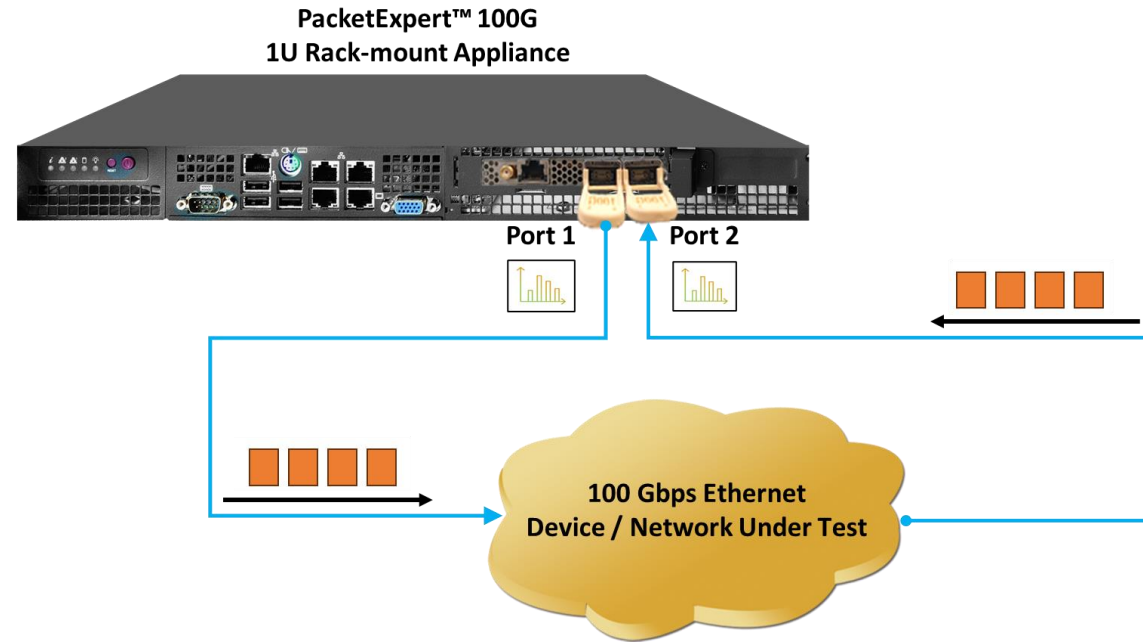
RFC 2544 Port Configuration ● Idle Select Port Port1-Port2 ☒ Symmetrical

Summary Layer MAC VLAN MPLS IP UDP Payload

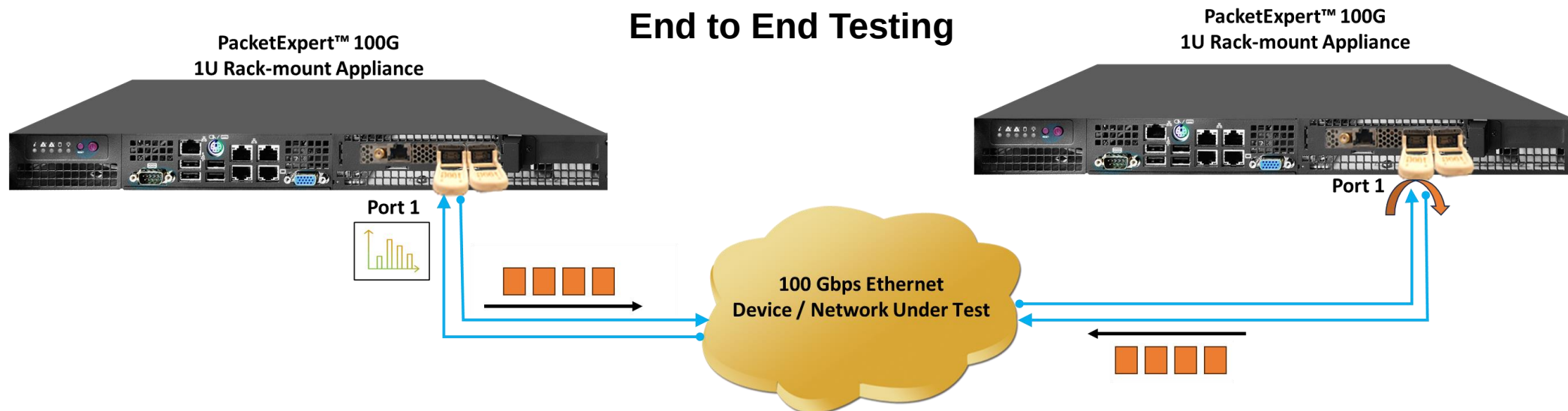
Description	East <=> West
Layer	UDP
MAC	
Source MAC Address	00-0D-E9-08-D2-EB (HW MAC Address)
Destination MAC Address	00-0D-E9-08-D2-EC
Len/Type	88-47
VLAN	Enabled
VLAN #1 Type	81-00
VLAN #1 Id	0
VLAN #1 Priority	0
VLAN #2 Type	88-A8
VLAN #2 Id	0
VLAN #2 Priority	0
VLAN #3 Type	91-00
VLAN #3 Id	0
VLAN #3 Priority	0
MPLS	Enabled
MPLS #1 Label	111111
MPLS #1 CoS	1
MPLS #1 TTL	128
MPLS #2 Label	222222
MPLS #2 CoS	1
MPLS #2 TTL	128
MPLS #3 Label	333333
MPLS #3 CoS	1
MPLS #3 TTL	128
IP	
IP Selection	IPv4
Source IP Address	192.168.1.11
Destination IP Address	192.168.1.12
Default Gateway	192.168.1.1
Subnet Mask	255.255.255.0
TTL	128
ToS/DS	0
Protocol	17
Header Checksum	Auto
Identification	Auto
UDP	
Source UDP	1001
Destination UDP	1002
Checksum	Auto
Payload	
Payload	1234

RFC 2544 Throughput Test Setup

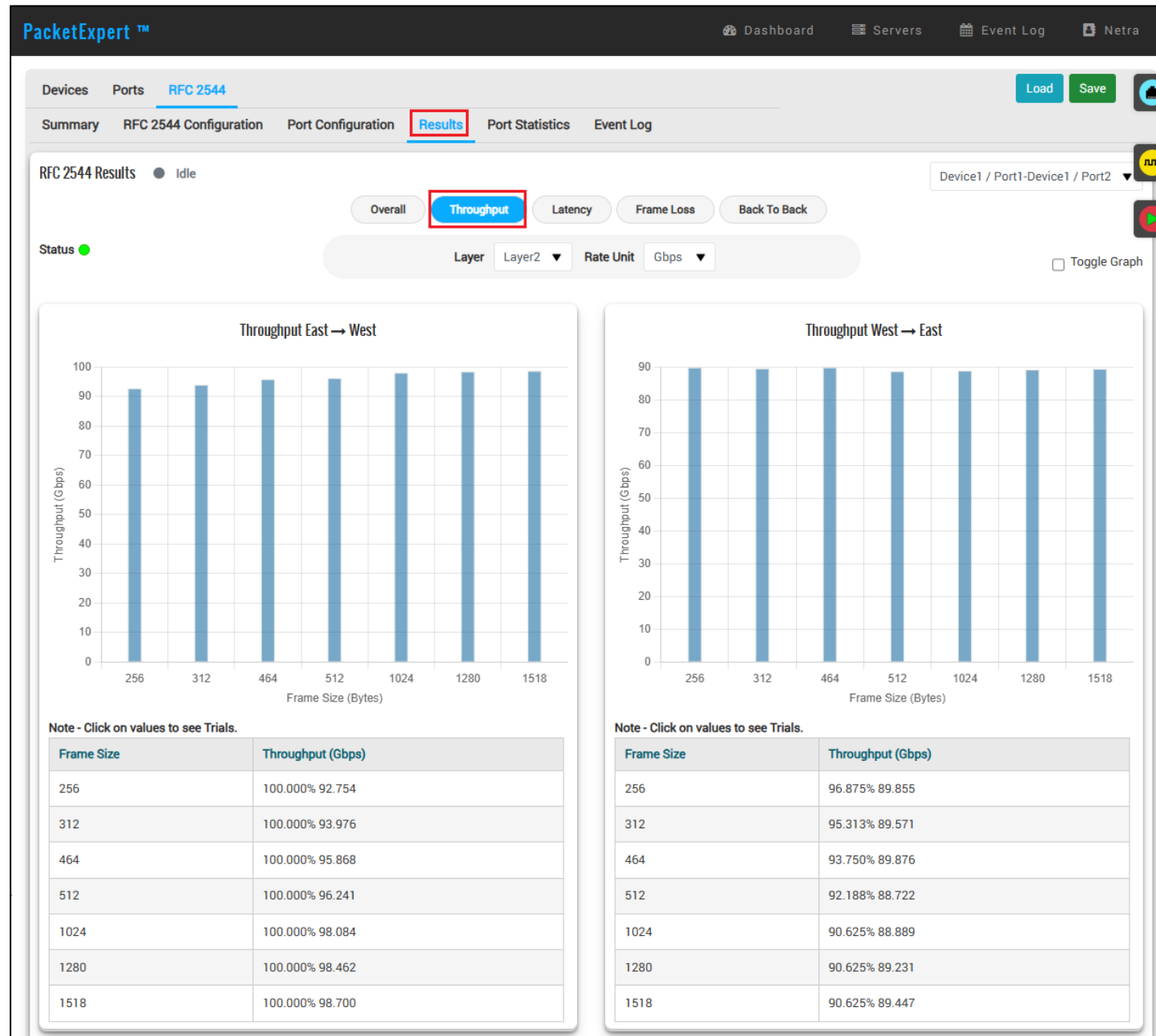
Loopback Testing



End to End Testing

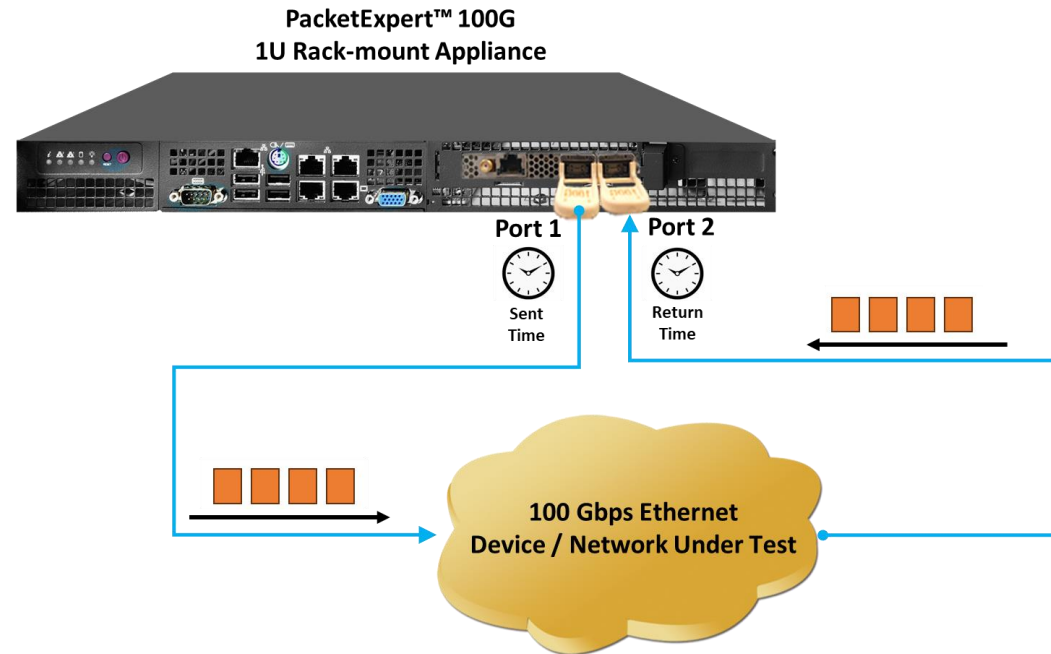


RFC 2544 Results - Throughput

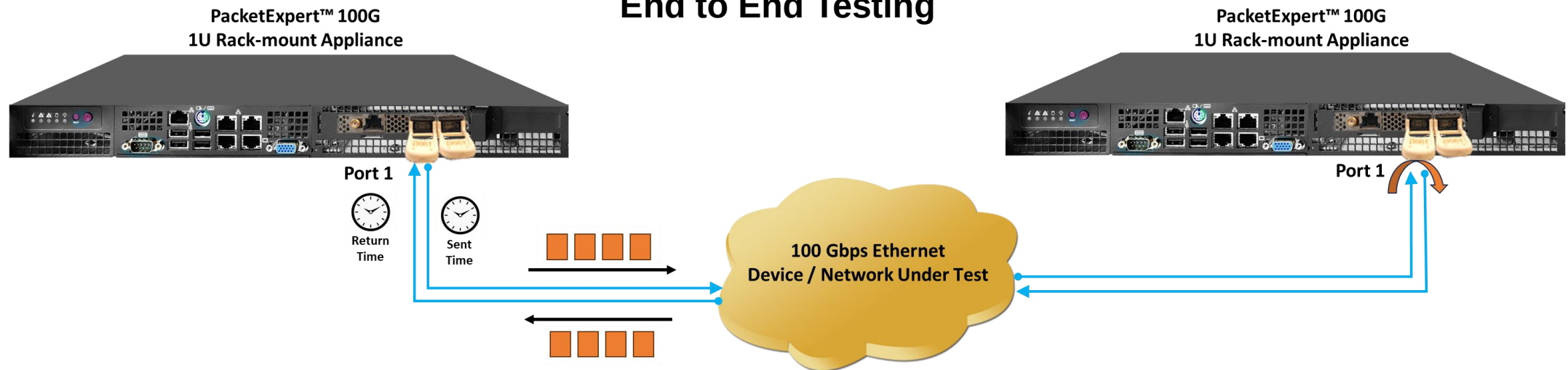


RFC 2544 Latency Test Setup

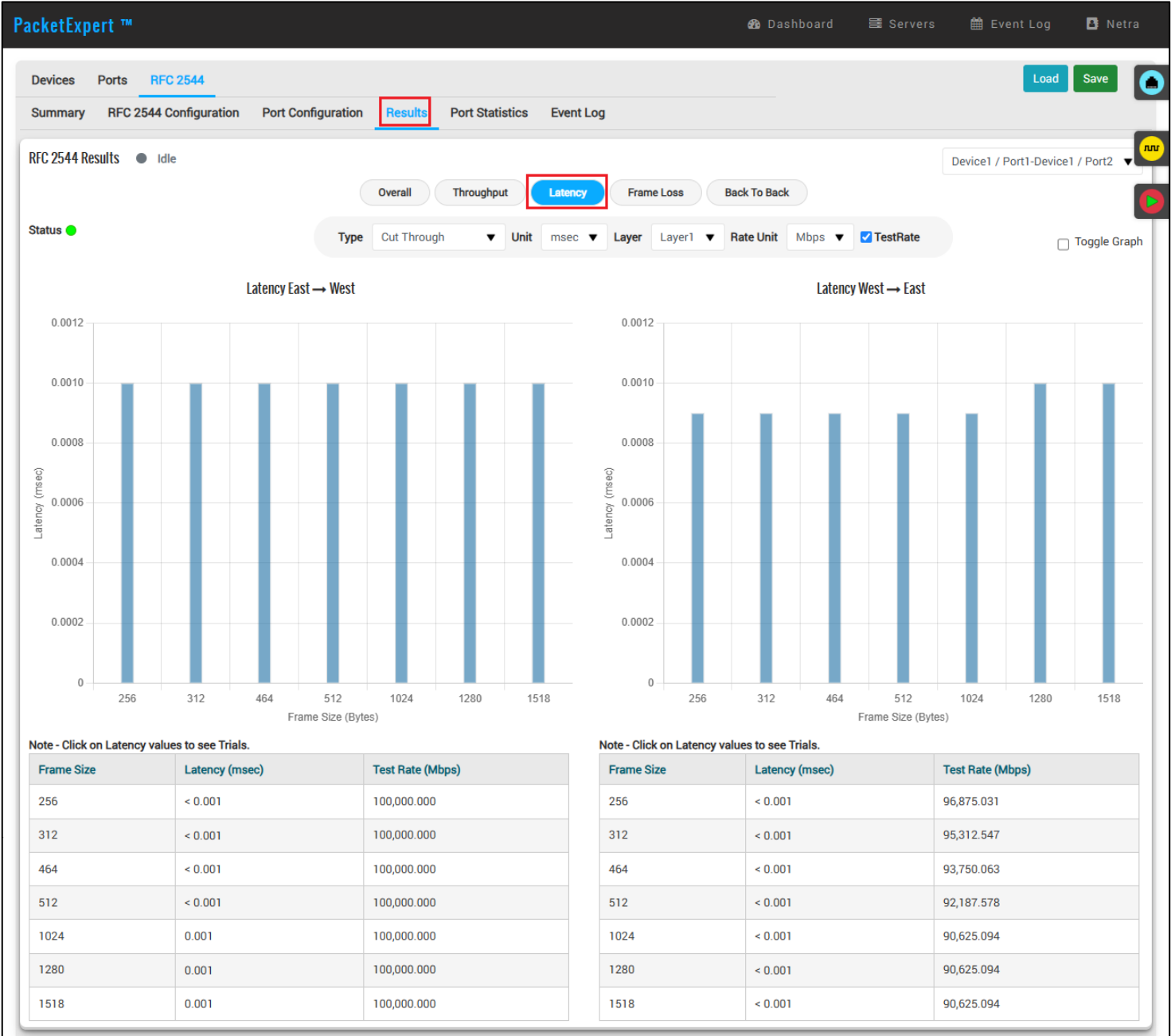
Loopback Testing



End to End Testing



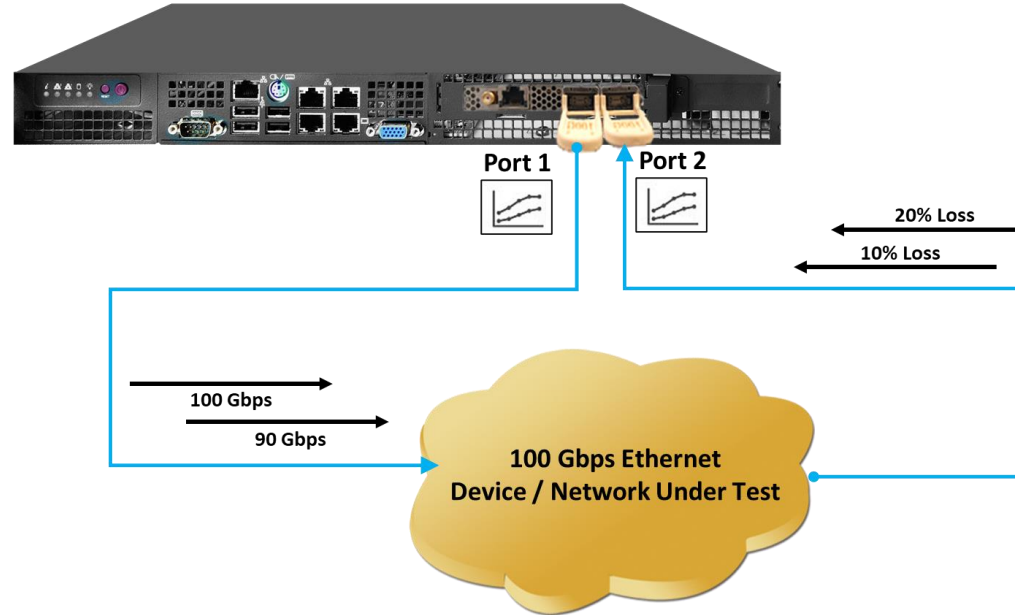
RFC 2544 Results - Latency



RFC 2544 Frame Loss Test Setup

Loopback Testing

PacketExpert™ 100G
1U Rack-mount Appliance



End to End Testing

PacketExpert™ 100G
1U Rack-mount Appliance

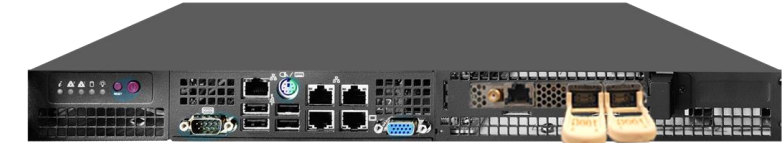


Port 1

90 Gbps
100 Gbps
10% Loss
20% Loss

100 Gbps Ethernet
Device / Network Under Test

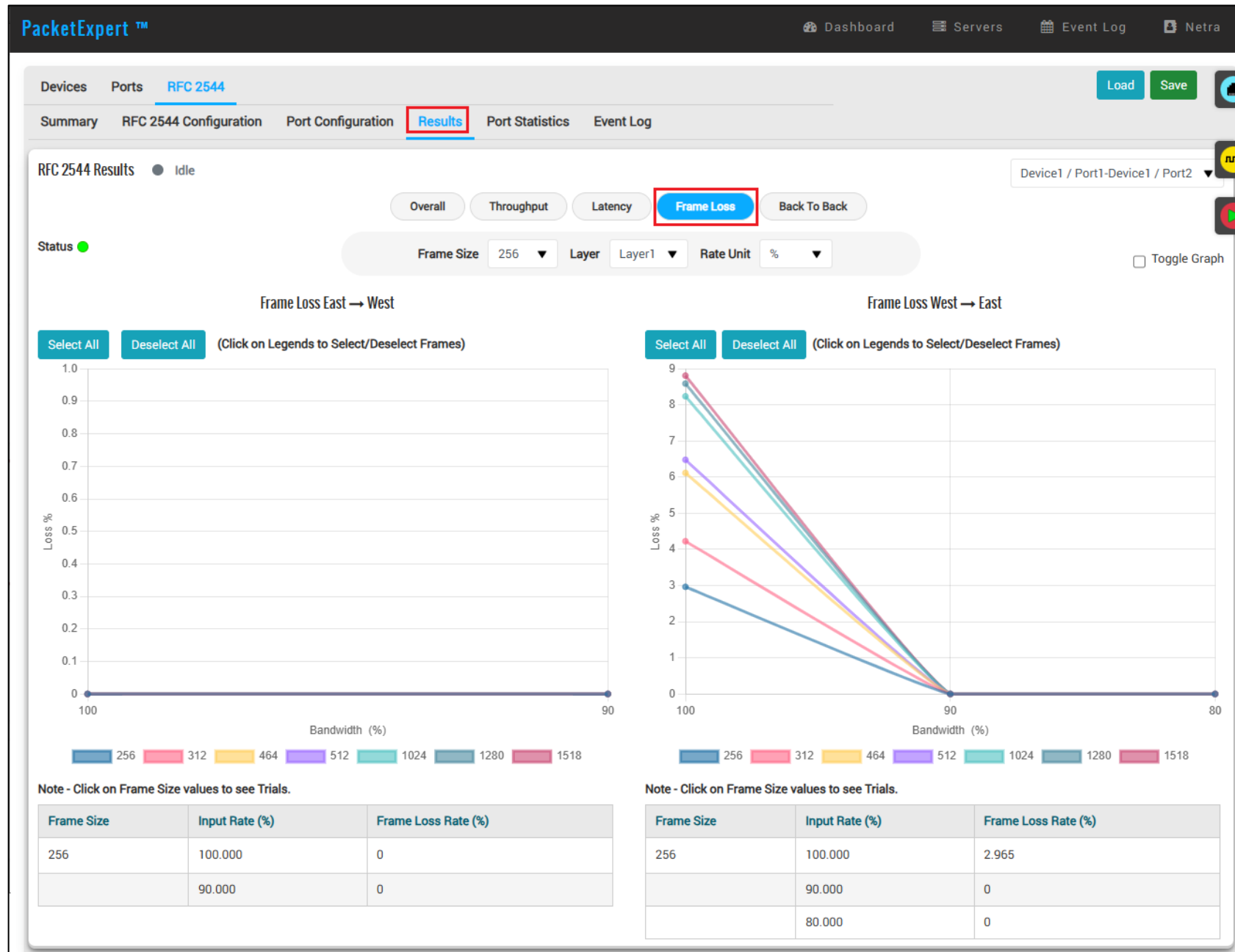
PacketExpert™ 100G
1U Rack-mount Appliance



Port 1

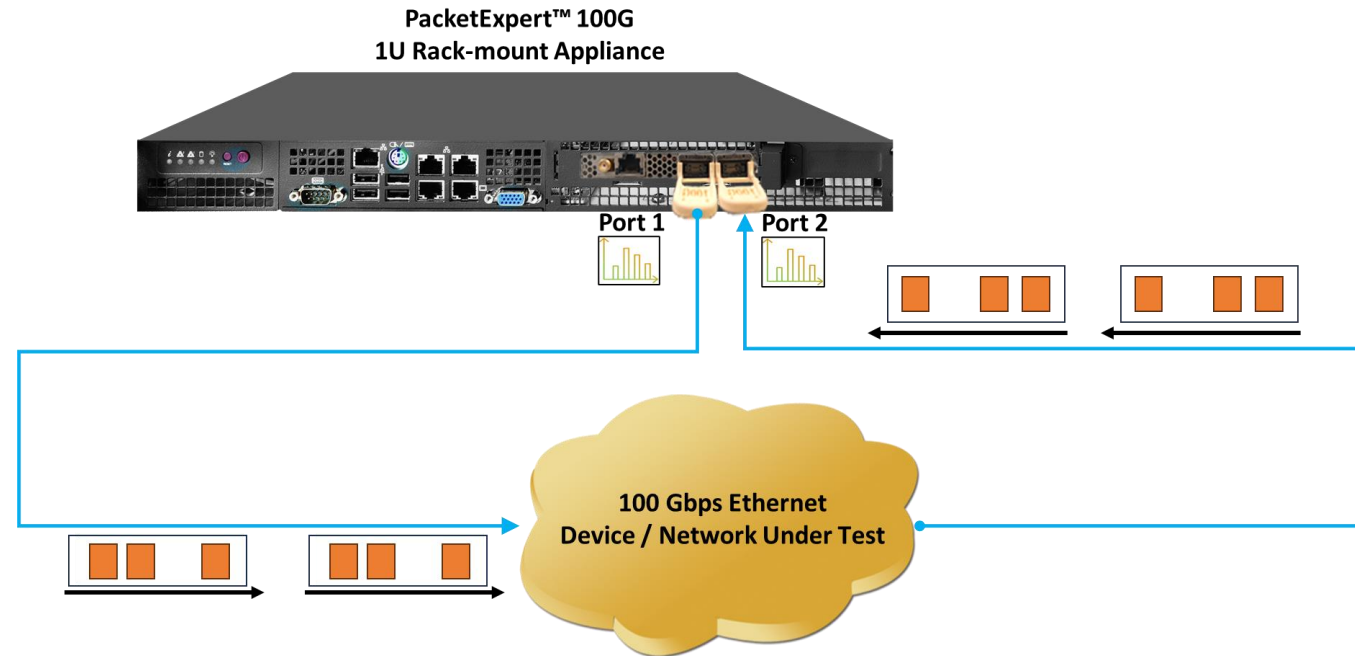
90 Gbps
100 Gbps

RFC 2544 Results - Frame Loss

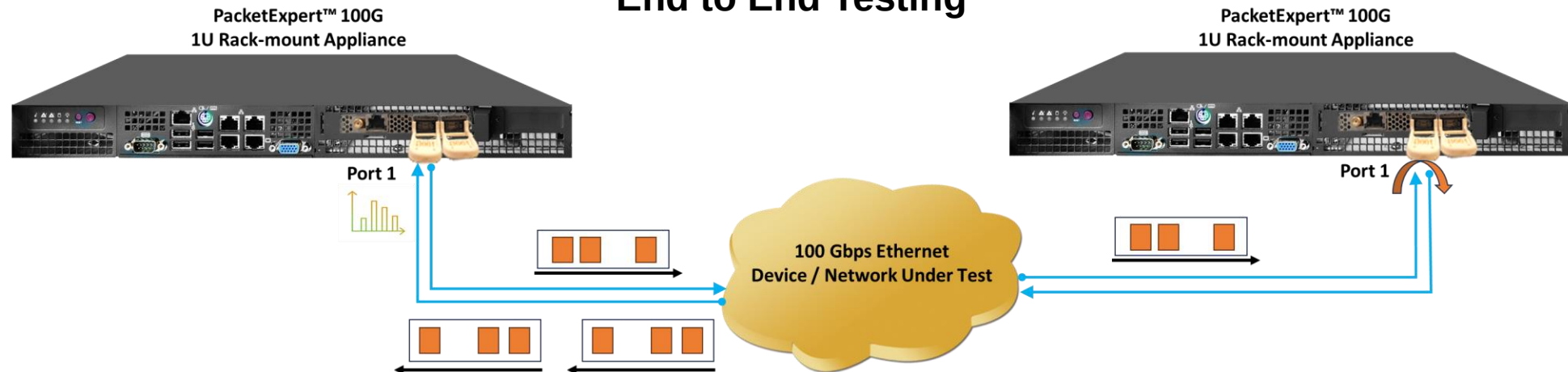


RFC 2544 Back-to-Back Test Setup

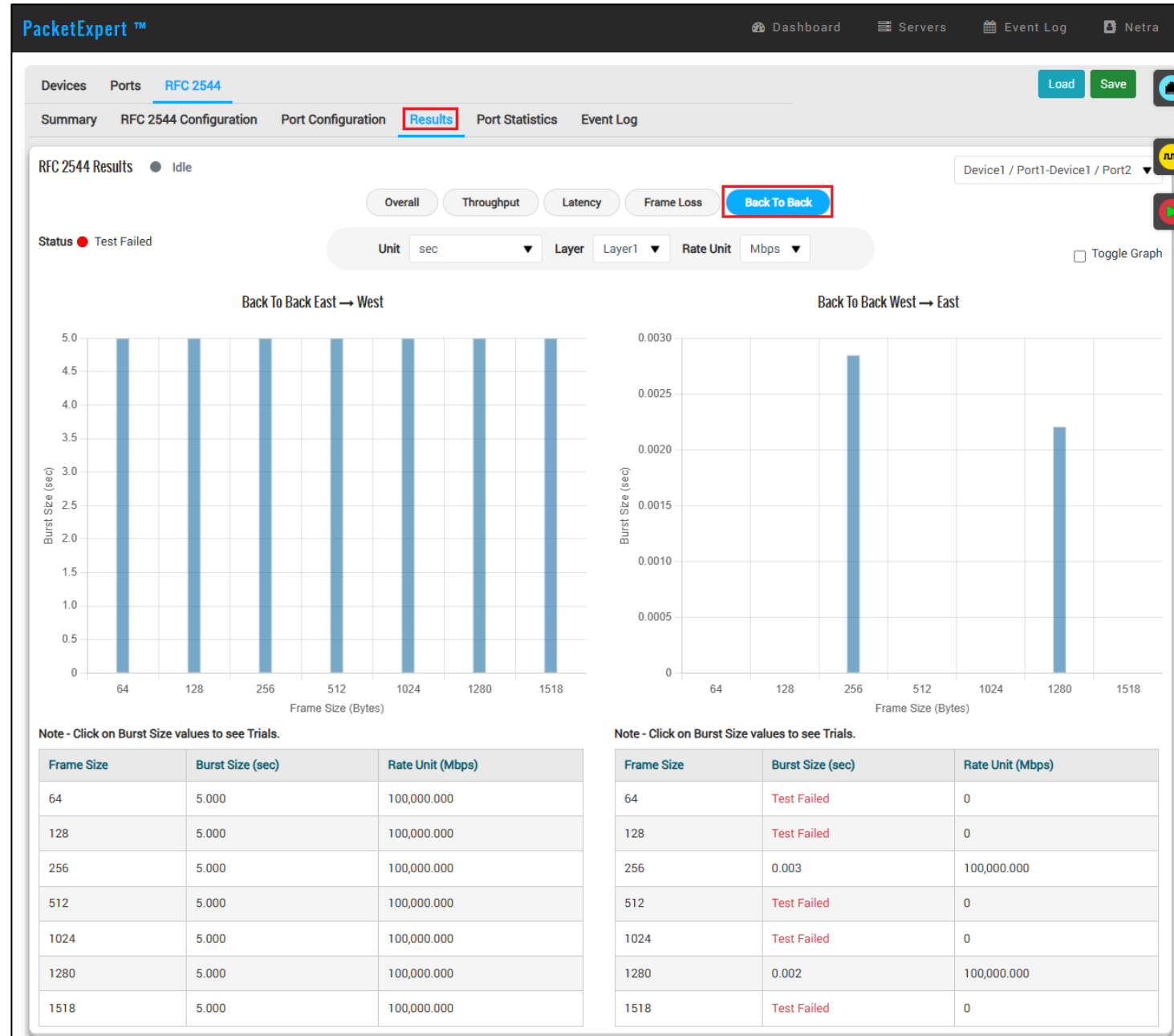
Loopback Testing



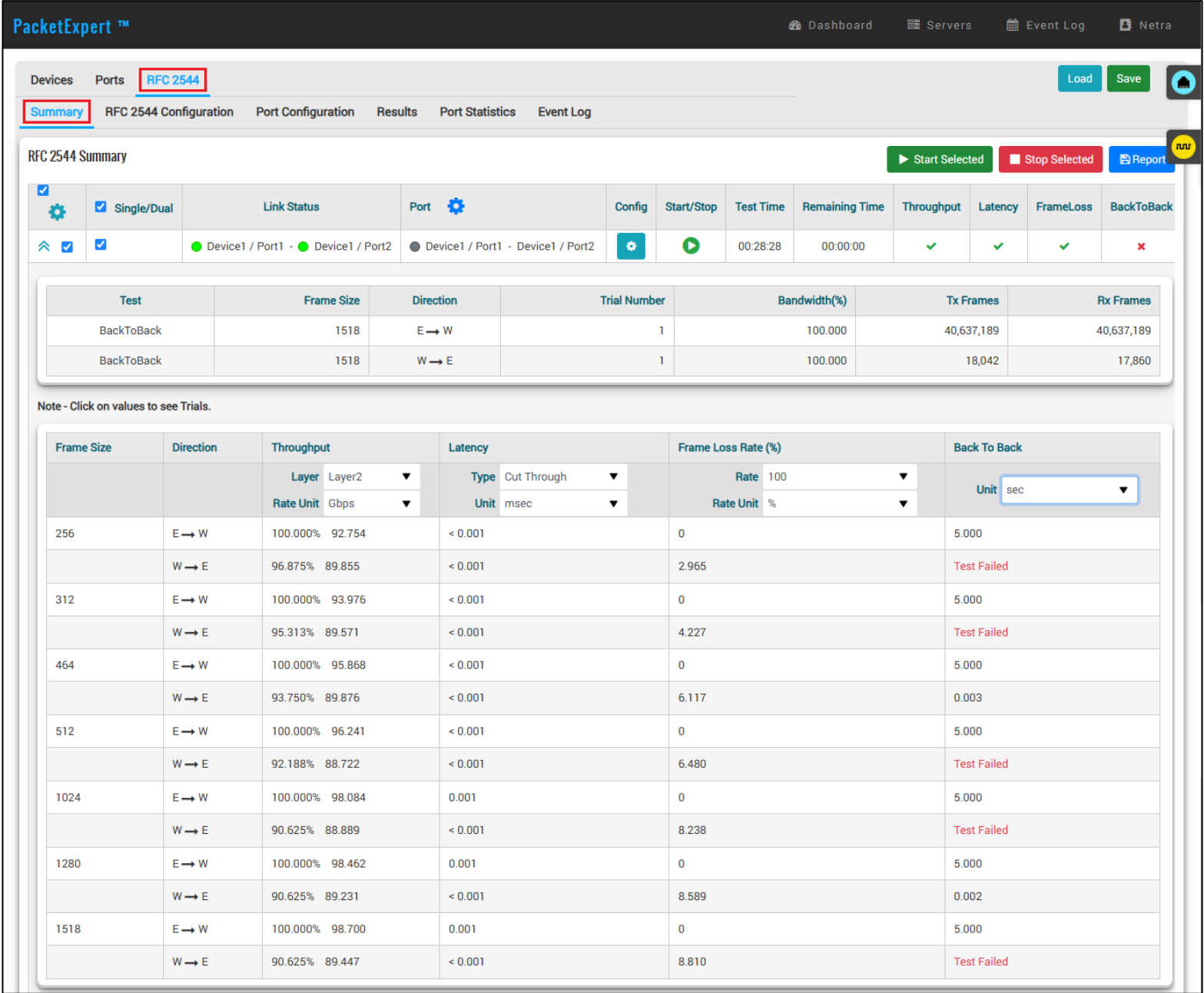
End to End Testing



RFC 2544 Results: Back-to-Back



RFC 2544 Result Summary

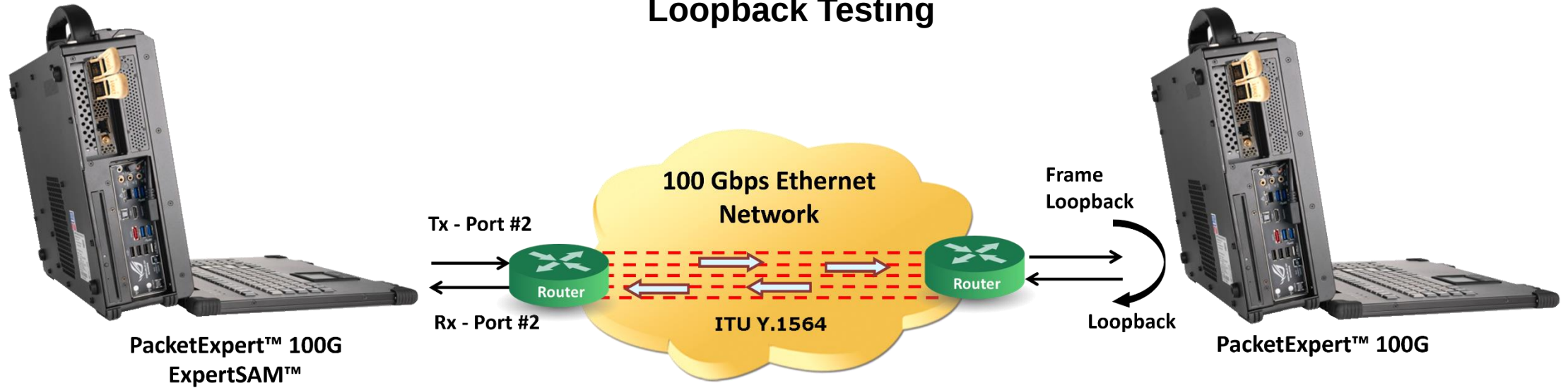


Addressing Network Challenges with Y.1564 (ExpertSAM™)

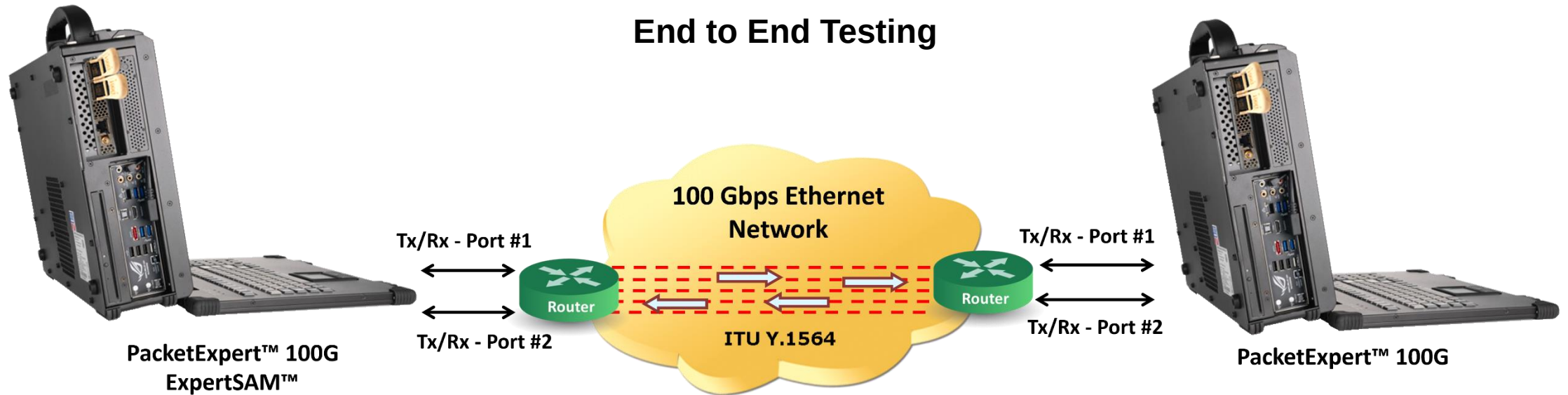
- Service Activation Verification
- Performance Measurement
- Service-Level Agreement (SLA) Conformance
- Multiple Service/stream Simultaneity
- Configuration Testing
- Network Troubleshooting and Optimization
- End-to-End Service Testing

Ethernet Network Testing

Loopback Testing



End to End Testing



Y.1564 Features

- Complete validation of Ethernet Service-Level Agreements (SLAs) in a single test
- Supports Service Configuration and Service Performance tests in compliance with ITU-T Y.1564 standard
- Capability to generate traffic at throughput of CIR (guaranteed traffic), EIR (best effort bandwidth) and Traffic Policing rates (dropped bandwidth) ensuring Key performance indicators (KPI) validation
- Color Aware mode supported – generates Green/Yellow color marked traffic at the configured rates and provides Green and Yellow measurements separately. VLAN PCP, IP TOS and IP DSCP color marking supported
- Stacked VLAN supported – C-Tag (Customer Tag) and S-Tag (Service Tag) to simulate Carrier Ethernet traffic
- Simultaneous validation of all the services for quality over the time

Service Configuration Summary

PacketExpert™

DashboardServersEvent LogAdmin

DevicesPortsExpertSAM

LoadSave

SummaryService ConfigurationService SelectionTest ConfigurationService Configuration ResultsService Performance ResultsGraphsPort Statistics

All Port StatisticsEvent Log

Service Configuration

Y.1564 SpecificSAM1

SummaryFrame SizeLayerMACVLANMPLSIPUDPPayloadBandwidth ProfileColor AwareSLA Parameters

Svc1 Configuration

DescriptionLeft ↔ Right

Frame SizeType-Fixed [100]

LayerUDP

MAC

Source MAC Address00-0D-E9-08-D2-EB (HW MAC Address)

Destination MAC Address00-0D-E9-08-D2-EC

Len/Type88-47

VLAN

Enabled

C-Tag Type81-00

C-Tag Id0

C-Tag Priority0

S-Tag Enabled

S-Tag Type88-A8

S-Tag Id0

S-Tag Priority0

MPLS

Enabled

MPLS #1 Label111111

MPLS #1 CoS1

MPLS #1 TTL128

MPLS #2 Label222222

MPLS #2 CoS1

MPLS #2 TTL128

MPLS #3 Label333333

MPLS #3 CoS1

MPLS #3 TTL128

IP

IP SelectionIPv4

Source IP Address192.168.1.11

Destination IP Address192.168.1.22

Default Gateway192.168.1.1

Subnet Mask255.255.255.0

TTL128

ToS/DS0

Protocol17

Header ChecksumAuto

IdentificationAuto

UDP

Source UDP1001

Destination UDP1002

ChecksumAuto

Payload

PayloadAB-CD

Bandwidth Profile

CIR5 %

EIR10 %

Traffic Policing Rate20 %

Color Aware

Color Aware EnableDisabled

SLA Parameters

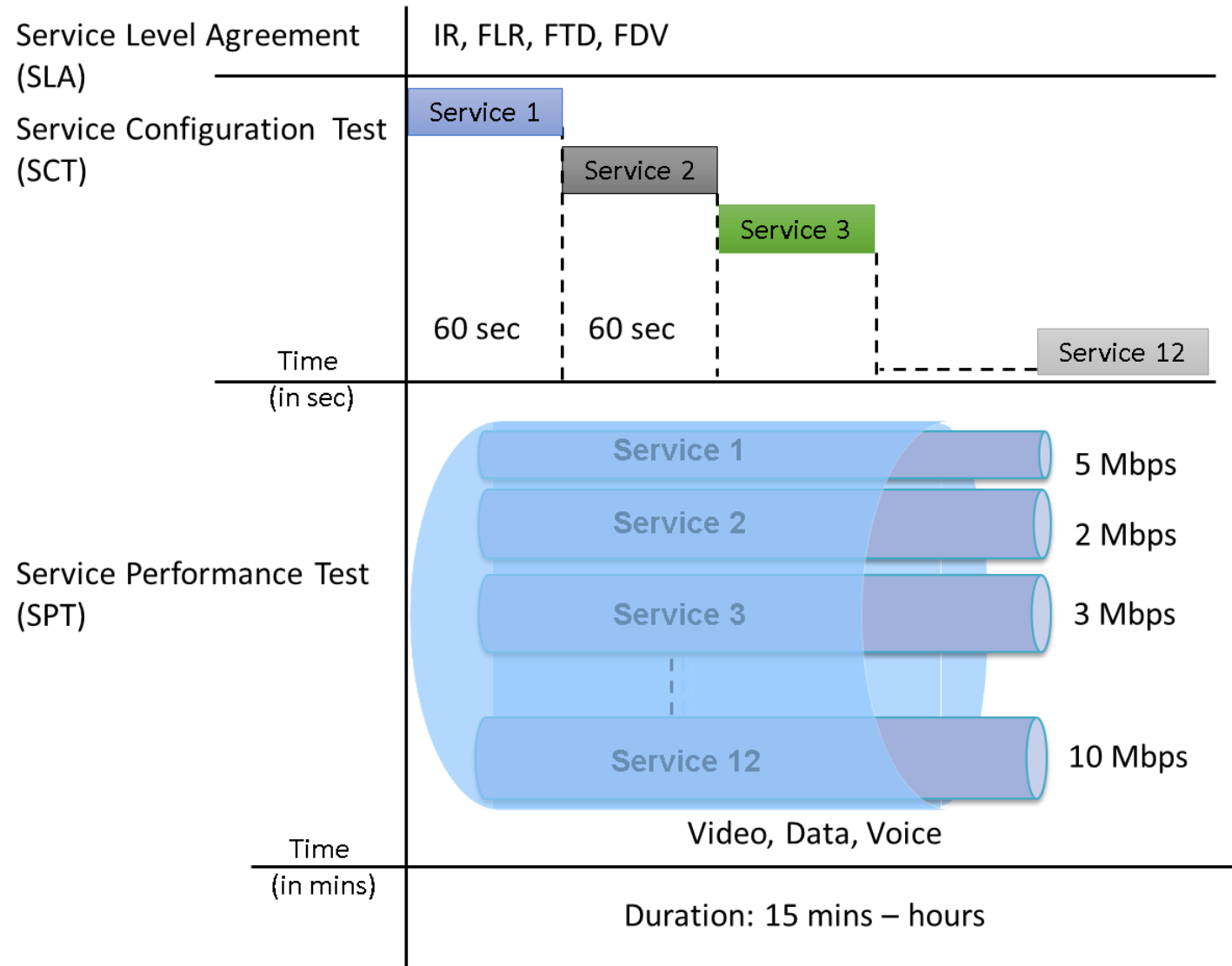
Frame Loss10 %

Frame Transfer Delay12 msec

Frame Delay Variation12 usec

Test Configuration

- **Service Configuration Test** - confirms the end-to-end configuration with the SLA parameters for all configured traffic streams
- **Service Performance Test** - transmits all configured traffic streams simultaneously at the committed information rate (CIR), confirming all traffic is able to transverse the network under full load with the above-mentioned parameters



Test Configuration (Contd.)

PacketExpert™

Dashboard Servers Event Log Admin

Devices Ports ExpertSAM Load Save

Summary Service Configuration Service Selection **Test Configuration** Service Configuration Results Service Performance Results Graphs Port Statistics

All Port Statistics Event Log

Test Configuration

← → SAM1 ▶

☒ Service Config Test

CIR Configuration Test

☐ Simple CIR ☒ Step Load CIR

☒ EIR Configuration Test

☐ Traffic Policing Test

Step Duration (5-60 sec)



+ Step	Rate (% of CIR) (1-100)	📄 🗑️
1	5	🗑️
2	10	🗑️
3	15	🗑️
4	20	🗑️
5	25	🗑️
6	30	🗑️
7	35	🗑️
8	CIR	
9	EIR	

☒ Service Performance Test

Duration

Service Configuration Results

PacketExpert™

DashboardServersEvent LogAdmin

DevicesPortsExpertSAM

LoadSave

SummaryService ConfigurationService SelectionTest ConfigurationService Configuration ResultsService Performance ResultsGraphsPort StatisticsAll Port StatisticsEvent Log

OverviewDetails

Y.1564 SpecificSAM1

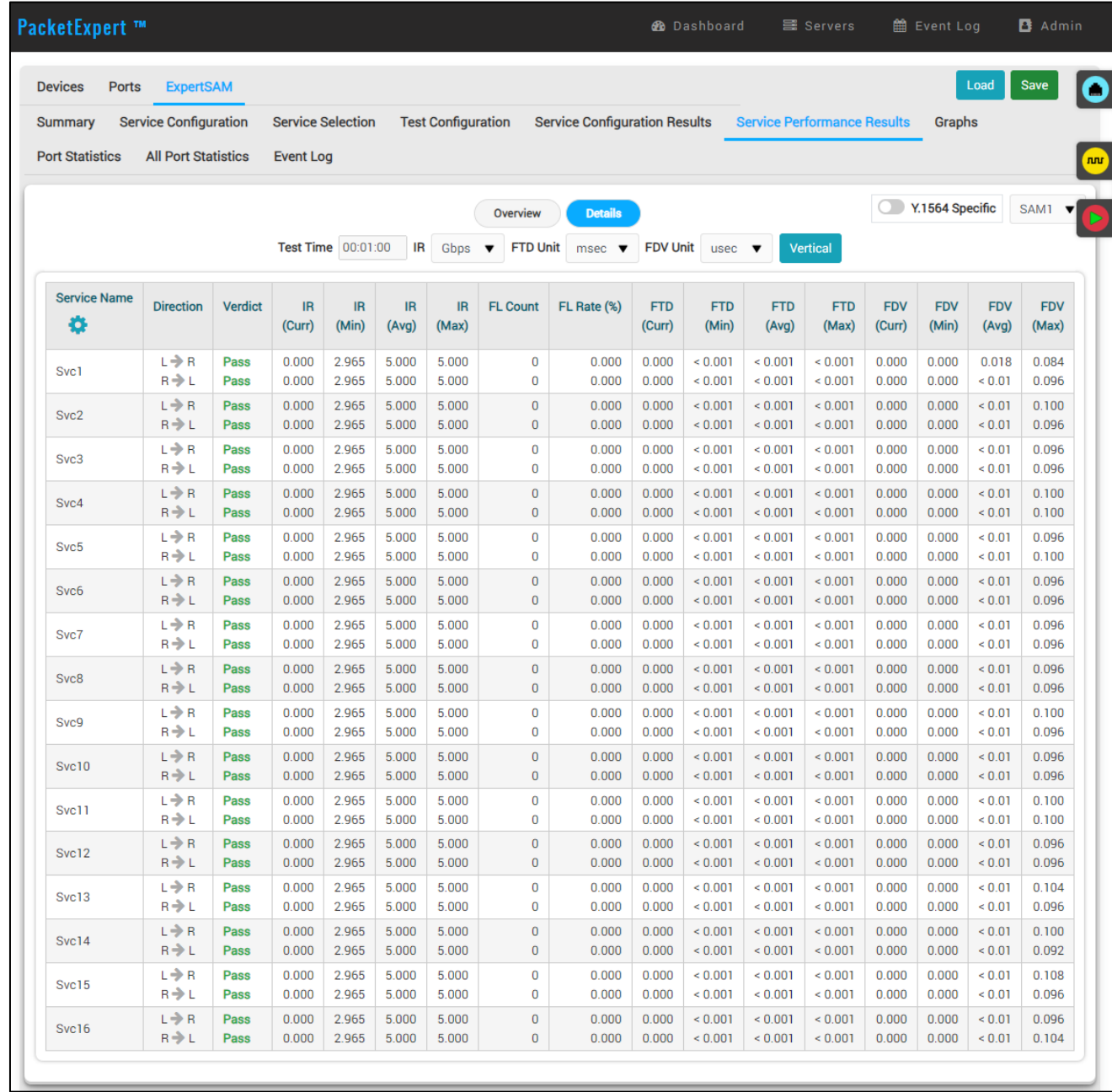
ServiceSvc1Test Time : 00:01:18IRGbpsFTD UnitusecFDV UnitusecVertical

Test	Direction	Verdict	Tx Frames	Rx Frames	Tx Bytes	Rx Bytes	IR (Curr)	IR (Min)	IR (Avg)	IR (Max)	FL Count	FL Rate(%)	FTD (Curr)	FTD (Min)	FTD (Avg)	FTD (Max)	FDV (Curr)	FDV (Min)	FDV (Avg)	FDV (Max)
Step1	L → R	Pass	3,142,002	3,142,002	314,200,200	314,200,200	0.000	0.002	0.282	0.500	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	3,133,776	3,133,776	313,377,600	313,377,600	0.000	0.014	0.281	0.500	0	0.000	0.000	0.388	0.321	0.408	0.000	0.000	< 0.01	0.020
Step2	L → R	Pass	9,391,221	9,391,221	939,122,100	939,122,100	0.000	0.082	0.596	1.000	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	9,610,832	9,610,832	961,083,200	961,083,200	0.000	0.082	0.647	1.000	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
Step3	L → R	Pass	18,790,380	18,790,380	1,879,038,000	1,879,038,000	0.000	0.194	0.896	1.500	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	19,010,010	19,010,010	1,901,001,000	1,901,001,000	0.000	0.194	0.896	1.500	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
Step4	L → R	Pass	31,353,449	31,353,449	3,135,344,900	3,135,344,900	0.000	0.292	1.197	2.000	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	31,573,044	31,573,044	3,157,304,400	3,157,304,400	0.000	0.291	1.197	2.000	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
Step5	L → R	Pass	47,015,575	47,015,575	4,701,557,500	4,701,557,500	0.000	0.386	1.492	2.500	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	47,235,055	47,235,055	4,723,505,500	4,723,505,500	0.000	0.386	1.492	2.500	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
Step6	L → R	Pass	65,862,514	65,862,514	6,586,251,400	6,586,251,400	0.000	0.200	1.801	3.000	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	66,082,040	66,082,040	6,608,204,000	6,608,204,000	0.000	0.200	1.801	3.000	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
Step7	L → R	Pass	87,850,190	87,850,190	8,785,019,000	8,785,019,000	0.000	0.234	2.101	3.500	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	88,070,495	88,070,495	8,807,049,500	8,807,049,500	0.000	0.234	2.101	3.500	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
CIIR	L → R	Pass	119,259,273	119,259,273	11,925,927,300	11,925,927,300	0.000	0.332	3.001	5.000	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	119,479,812	119,479,812	11,947,981,200	11,947,981,200	0.000	0.332	3.001	5.000	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
EIR	L → R	Pass	182,079,074	182,079,074	18,207,907,400	18,207,907,400	0.000	0.668	6.003	10.000	0	0.000	0.000	0.396	0.400	0.416	0.000	0.000	< 0.01	0.020
	R → L	Pass	182,298,699	182,298,699	18,229,869,900	18,229,869,900	0.000	0.667	6.002	10.000	0	0.000	0.000	0.388	0.392	0.408	0.000	0.000	< 0.01	0.020
Traffic Policing	L → R	Fail	308,367,406	308,367,406	30,836,740,600	30,836,740,600	0.000	1.332	12.077	20.000	0	0.000	0.000	0.396	0.257	0.416	0.000	0.000	< 0.01	0.020
	R → L	Fail	308,590,834	308,590,834	30,859,083,400	30,859,083,400	0.000	1.335	12.078	20.000	0	0.000	0.000	0.388	0.248	0.408	0.000	0.000	< 0.01	0.020

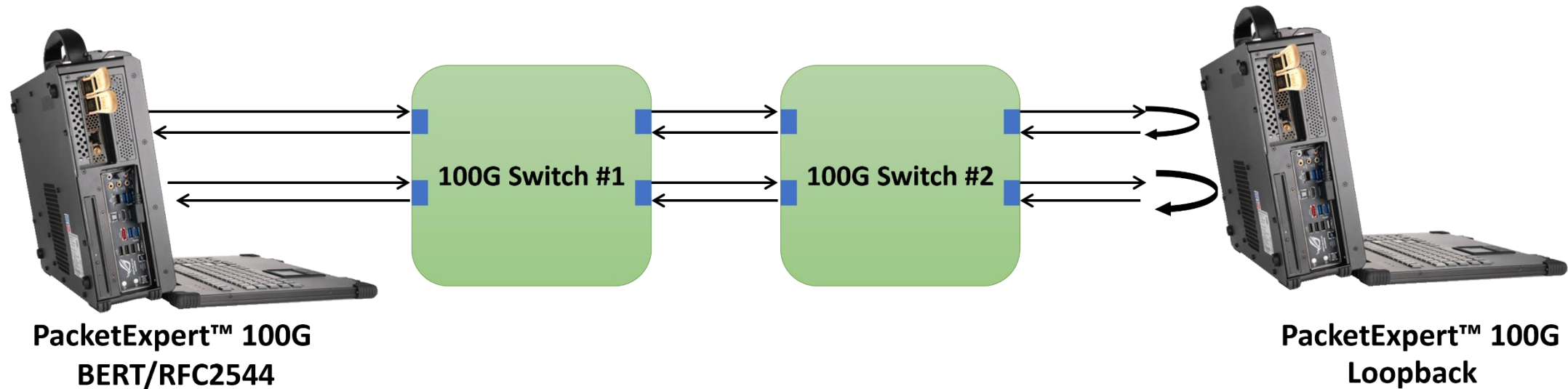
GL Communications

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Service Performance Results



Smart Loopback



Example:

MAC address - 00-00-00-00-00-01

IP Address - 192.168.1.100

UDP Port - 1000

Example:

MAC address - 00-00-00-00-00-02

IP Address - 192.168.1.200

UDP Port - 2000

- PacketExpert™ 100G has Loopback capability on both the ports
- PacketExpert™ 100G supports the Smart Loopback
- The above diagram depicts Loopback (Source and Destination MAC addresses swapped) prior to re-transmitting Ethernet frame

Smart Loopback (Contd.)

Incoming Packet

Ethernet Destination MAC Address	Ethernet Source MAC Address	Ethernet Length/Type field		Source IP Address	Destination IP Address	IP Protocol		Source UDP Port	Destination UDP Port
00-00-00-00 00 02	00-00-00-00-00-01	08 00 (IP)	...	192.168.1.100	192.168.1.200	17 (UDP)	...	1000	2000

Outgoing Packet (after swapping Source/Destination MAC addresses, Source/Destination IP Addresses and Source/Destination UDP Ports)

Ethernet Destination MAC Address	Ethernet Source MAC Address	Ethernet Length/Type field		Source IP Address	Destination IP Address	IP Protocol		Source UDP Port	Destination UDP Port
00 00-00 00 00-01	00-00-00-00-00-02	08 00 (IP)	...	192.168.1.200	192.168.1.100	17(UDP)		2000	1000

Loopback

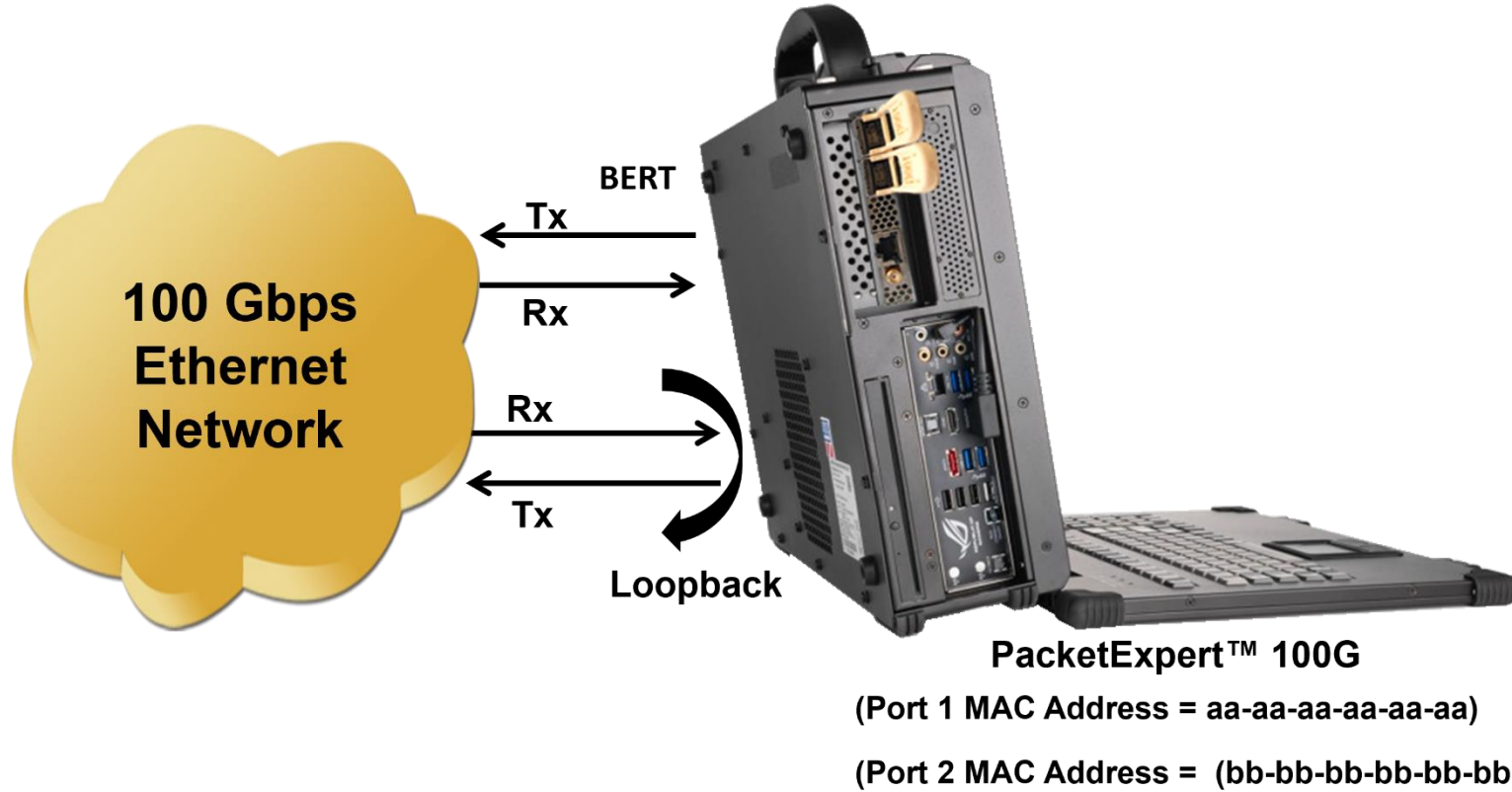
Rx

Tx



PacketExpert™ 100G

BERT and Loopback



- For testing across a network, the remote PacketExpert™ 100G can be left in Loopback mode
- BERT is controlled by the local end PacketExpert™ 100G

PacketExpert™ 100G Architecture



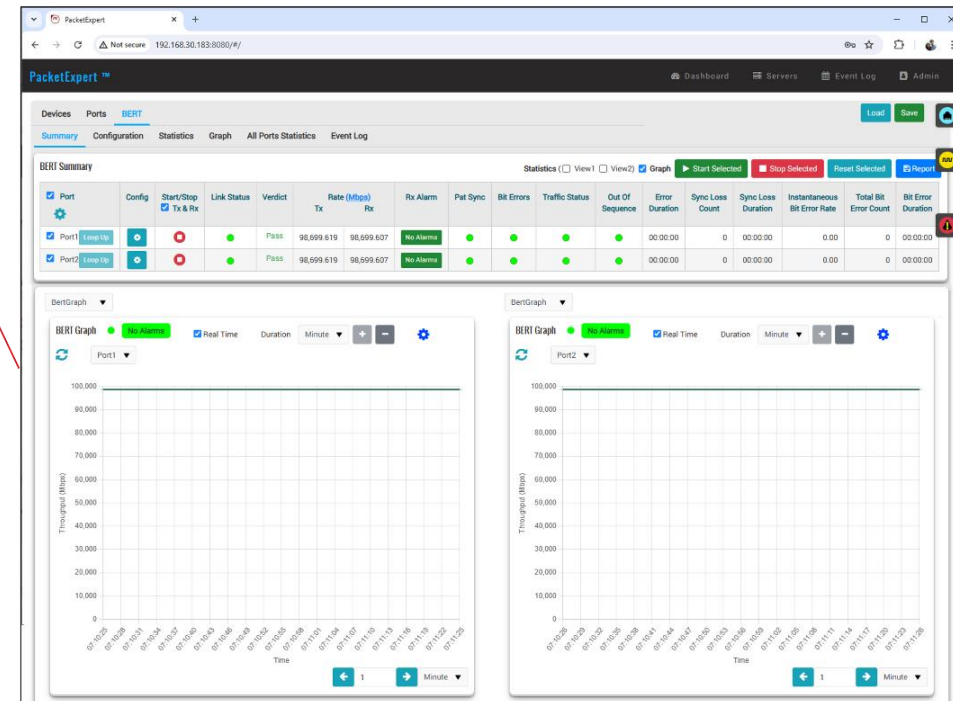
PacketExpert™ 100G



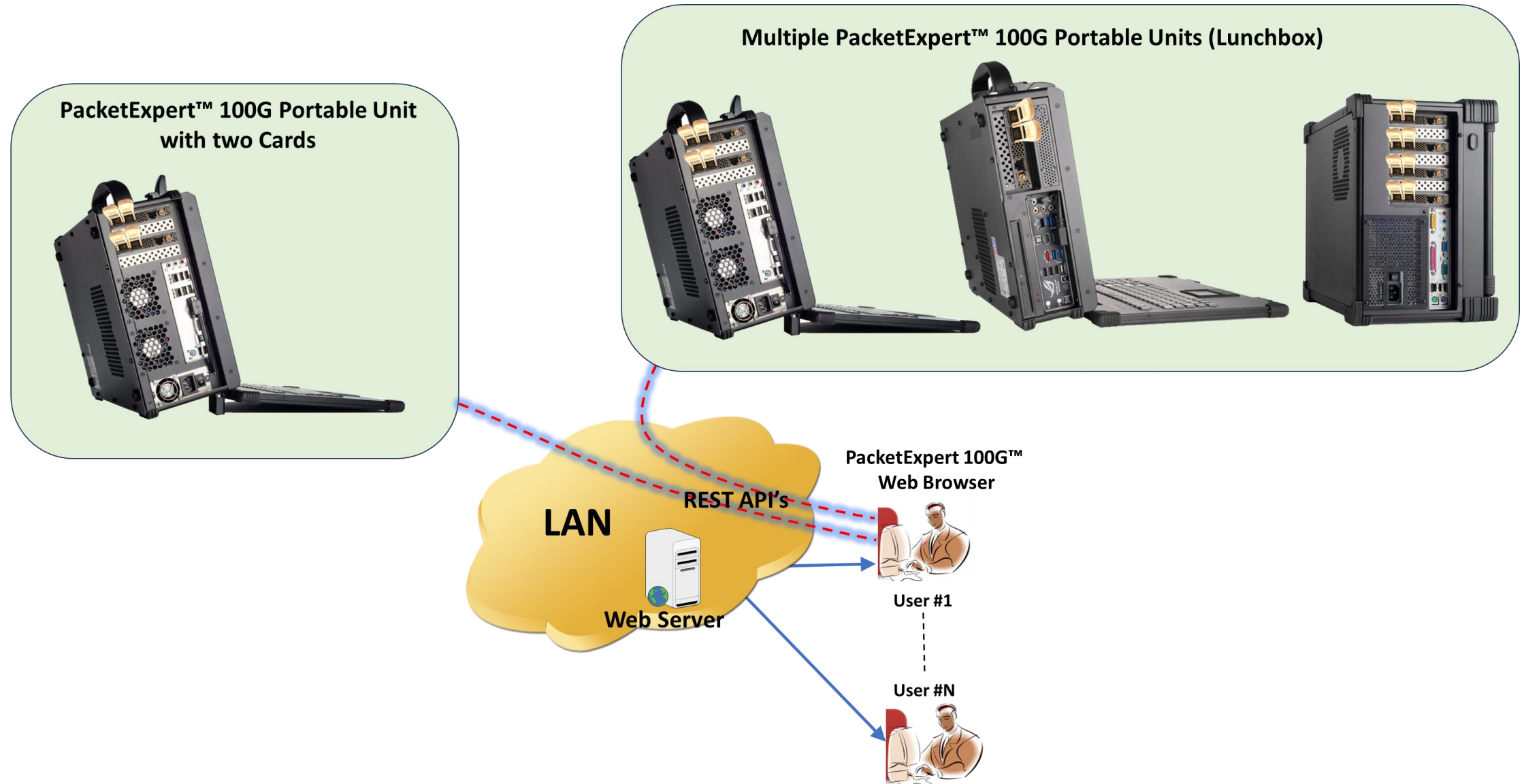
Alex on Web Browser



Bob on Web Browser

A screenshot of the PacketExpert web interface showing a login form. The form has fields for 'Username' (containing 'Alex') and 'Password' (containing '*****'), and a 'Login' button. The URL bar shows '192.168.1.152:8081/login'. The footer says 'GL Communications Inc. ©2023'.

PacketExpert™ 100G - Multiple Users with Multiple Servers and Devices



Supported PacketExpert™ Applications

The screenshot displays the PacketExpert web interface. The top navigation bar includes links for Dashboard, Servers, Event Log, and Admin. The main content area is divided into several sections:

- Devices:** A table listing three devices (Device1, Device2, Device3) with their Serial#, Availability (Reserved), User (Admin), Speed (1G), Application (All Port Loopback, RFC 2544, All Port BERT), and Test Status. Red arrows point to the 'Device' column (labeled 'Multi Devices') and the 'User' column (labeled 'Multi Users'). A dropdown menu for the 'All Port BERT' application is shown, listing options: All Port BERT, BERT/Loopback, All Port Loopback, RFC 2544, ExpertSAM, and MTGA. A red arrow points to this dropdown (labeled 'Applications').
- License Details:** A table showing two licenses (PXX101, PXX105) with their Part Number, Description, and Status (checked).
- MAC Addresses:** A table showing two MAC addresses (00-0D-E9-09-AE-4E, 00-0D-E9-09-AE-4F) and their corresponding Port #1 and Port #2.
- System Monitor:** A table showing system health metrics (Temperature Monitor, Over Temperature Monitor, Internal Voltage, Auxiliary Voltage) with their Value and Alarm status (green dot for OK, grey dot for alarm).
- Version:** A table showing the FPGA Version (d0.7.5) and Software Version (24.7.4.0).

Clock Frequency Measurement

PacketExpert™

DashboardServersEvent LogAdmin

DevicesPortsBERT

LoadSave

SummaryConfigurationStatisticsGraphAll Ports StatisticsEvent Log

BERT Summary

Statistics (View1)

☒ Port	Config	Start/Stop ☒ Tx & Rx	Link Status	Verdict	Rate (Mbps)		Rx Alarm	Pat Sync	Bit Errors	Traffic Status	Out Of Sequence
					Tx	Rx					
☒ Port1	Loop Up			Pass	98,699.607	98,699.607	No Alarms				
☒ Port2	Loop Up			Pass	98,699.607	98,699.607	No Alarms				

Port	Tx Total Frames	Rx Total Frames	Non Test Frames	FCS Error Frames	IP Checksum Errors	UDP Checksum Errors	Tx Link Utilization
Port1	481,706,667	481,664,995	0	0	0	0	100.000
Port2	481,673,306	481,683,987	0	0	0	0	100.000

Port	VLAN Frames	MPLS Frames	IPv4 Packets	IPv6 Packets	UDP Packets	ICMP Packets
Port1	0	0	481,664,993	0	481,664,993	0
Port2	0	0	481,683,985	0	481,683,985	0

Port Clock Status

Select PortPort1Reset

Clock SourceInternal

Offset0ppm0Hz+-

	Frequency (Hz)	Deviation (ppm)	Max Deviation (ppm)
Tx	103,125,015,360.000	0.15	0.25
Rx	103,125,015,680.000	0.15	-8.70

Layer 1 Alarms and Errors

PacketExpert™

Dashboard Servers Event Log Netra

Devices Ports RFC 2544 Load Save

Settings SFP Info SFP Monitor **Alarms/Errors** Graphs

Alarms/Errors Select Port Device1 / Port1 Reset

Ethernet PCS

Alarms

Description	Alarms	Duration
Link Status	●	00:00:00
Local Fault Detected	●	00:00:00
Local Fault Received	●	00:00:00
Remote Fault Detected	●	00:00:00
High BER	●	00:00:00

Errors

Description	Status	Duration	Count	Rate
FCS Error Packets	●	00:00:00	0	0.000
Stomped FCS Error Packets	●	00:00:00	0	0.000
Code Violations	●	00:00:00	0	-
Jabber Packets	●	00:00:00	0	0.000
Too Long Packets	●	00:00:00	0	0.000
Runt Packets	●	00:00:00	0	0.000
Undersized Packets	●	00:00:00	0	0.000

Report Generation

Report Generation

Test Conducted By
Tester

Customer Name
GL Communications

Operator Name
Admin

Title
Packetexpert™ 100G BERT

Comments
BERT - Layer 4

Header
Packetexpert™ 100G BERT Report

Footer
Packetexpert™ 100G BERT Report

Report Format
PDF

File Name
CSV

Select Ports

Server192.168.30.183

☒ Port1

☒ Port2

Generate Report

Cancel

Packetexpert 100G BERT Rep

Page 1 of 16

 **GL Communications Inc.**

PDF Report **PacketExpert Report**

Packetexpert 100G BERT

Conducted By : Tester

Customer Name : GL Communications

Operator Name : Admin

Software Version : 24.7.5.0

Time Zone : Eastern Standard Time

Start Date : 07-09-2024 06:19:06

End Date : 07-09-2024 06:27:43

Test Duration : 00:08:36

Test : AllPortBERT

Comments : BERT - Layer4

Packetexpert 100G BERT Rep

07/09/2024 6:32:36

AutoSave BERT Report (7) Search Srikanth Ramaprasad

File Home Insert Page Layout Formulas Data Review View Automate Developer Help

Port

CSV Report

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Port	Test Time	Bit Error C	Bit Error S	Sync Loss	Out Of Seq	Bits Recei	Bit Error R	Sync Loss	Out Of Seq	Error Free	Tx Link Ut	Rx Link Ut	Tx Data Ra	Rx Data Ra	Tx Bad Fra	Rx Bad Fra	Tx Non T	Rx Non T	Tx FCS Err	Rx FCS Err	Tx IP Check
2	Port1	84:34:29	0	0	0	0	2.91E+14	0	0	0	304467	0	0	0	0	0	0	0	96	-	0	-
3	Port2	84:34:29	0	0	0	0	2.91E+14	0	0	0	304467	0	0	0	0	0	0	0	96	-	0	-
4																						

BERT Report (7)

Ready Accessibility: Unavailable Count: 83 100%

Event Log

PacketExpert™

DashboardServersEvent LogAdmin

DevicesPorts**BERT**

LoadSave

SummaryConfigurationStatisticsGraphAll Ports Statistics**Event Log**

Event Log

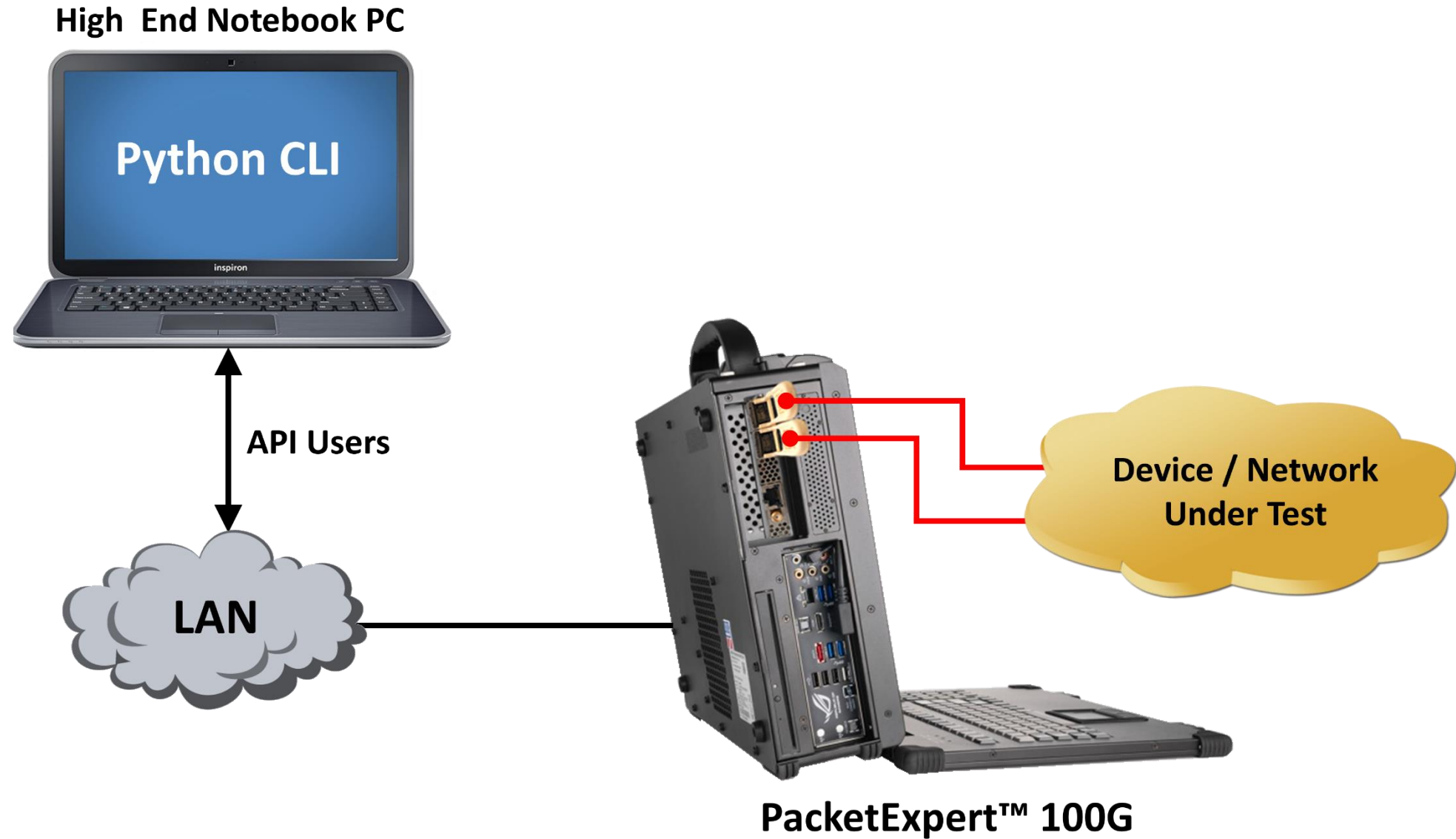
Port1▼Save As CSV

Id	Name	Start Time	Duration	Details
1	Start Rx	07-23-2024 11:52:03.899	00:00:01	-
2	Idle	07-23-2024 11:52:04.198	00:00:02	-
3	Start Tx	07-23-2024 11:52:06.008	00:00:01	-
4	Continuous Bit Error Insertion	07-23-2024 11:52:17.185	00:00:09	Rate : 10 ⁻⁴
5	Stop Tx	07-23-2024 11:52:31.455	00:00:01	-
6	Stop Rx	07-23-2024 11:52:34.486	00:00:01	-

Port2▼Save As CSV

Id	Name	Start Time	Duration	Details
1	Start Rx	07-23-2024 11:52:05.969	00:00:01	-
2	Start Tx	07-23-2024 11:52:06.013	00:00:01	-
3	Bit Error	07-23-2024 11:52:17.191	00:00:11	Current:98,261,627/Total:98,261,627
4	Stop Tx	07-23-2024 11:52:31.456	00:00:01	-
5	Stop Rx	07-23-2024 11:52:33.471	00:00:01	-

Python Client



Python Script

```
AllPortBert_Sample_app.py x
1  from Core.Utils import *
2  from PacketExpertTests import *
3  import time
4
5
6  def main():
7      # Specify server details and test configuration
8      server_ip = "192.168.1.152"
9      server_port = 3333
10     device_list = [1]
11     port_list = [1, 2]
12
13     err, device_test_configuration = set_device_traffic_config(device_list)
14
15     # Configure TC1 Bert Test Parameters
16
17     device_test_configuration[1].port_mode = PortMode.Gbps100
18     device_test_configuration[1].start_frame_size = 64
19     device_test_configuration[1].start_rate = 1
20     device_test_configuration[1].start_error_rate = 4 # Bit error insertion rate 10^-4
21
22     test_duration = 10
23
24     default_json_path = 'C:\\Users\\Desktop\\PXXPythonClient-Release\\JSON\\'
25     result_file_path = 'C:\\Users\\Desktop\\PXXPythonClient-Release\\Log\\'
26     result_file_name = "Bert_Results"
27
28     generate_report_info = GenerateReport()
29     generate_report_info.test_conducted_by = "GLIndia"
30     generate_report_info.filename = "Bert_Report"
31     generate_report_info.title = "All Port Bert"
32
33     generate_report_info.init_selected_ports(device_list, port_list, AppName.AllPortBERT)
34
35     enable_generate_report = True
```

Thank you