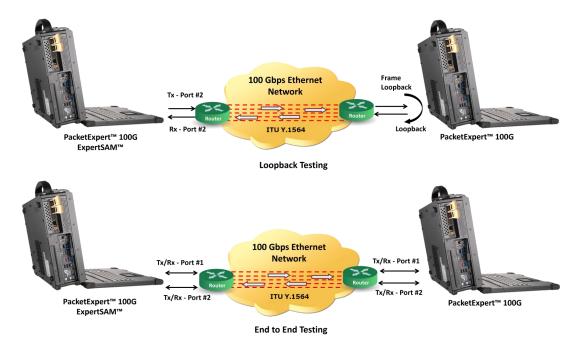
ExpertSAM[™] - PacketExpert[™] 100G

Validate Ethernet Service Level Agreements per ITU-T Y.1564



Overview

GL's **ExpertSAM™** is a basic application available within the PacketExpert[™] 100G. ExpertSAM[™] is designed for multiservice applications to measure the maximum performance of a Device or the Network Under Test. It consists of a set of procedures that assess the capability of Ethernet-based services to handle various types of traffic (voice, data, and video) at specified performance levels. Specifically, it aims to overcome the limitations of traditional RFC 2544 test procedures, particularly in the context of Service Level Agreements (SLA).

In ExpertSAM[™] test methodology Bandwidth CIR/EIR/Overshoot traffic, Frame Loss, Frame Delay and Frame Delay Variation are measured and compared to the expected values for each service ensuring it is within its committed range or the threshold defined for guaranteed traffic such as CIR (Committed Information Rate).

For more information, please visit <u>PacketExpert[™] - ExpertSAM[™] (ITU-T Y.1564)</u> webpage.

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
- Each port supports up to 16 streams, allowing the device to handle a total of 32 services with varying performance requirements under full load conditions.
- Supported EMIX (Ether MIX) frame sizes up to 5 frame sizes per service
- Support for frame lengths from 64 bytes to Jumbo frames (up to 16000 bytes)
- Information Rate (IR) or Throughput, Frame Loss Ratio (FLR), Frame Transfer Delay (FTD) or Latency, and Frame Delay Variation (FDV) or Jitter, measured simultaneously for multi streams, and Pass/Fail verdict declared
- Simultaneous validation of all the services for quality over the time
- Test automation and regression testing via Python and REST APIs
- Precision Time Protocol (PTP) based synchronization ensures precise delay measurements.

🔊 GL Communications Inc.

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A (Web) <u>www.gl.com</u> - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) <u>info@gl.com</u>

ITU-T Y.1564 ExpertSAM™

The ITU-T Y.1564 is based on two primary subtests: the Service Configuration Test and the Service Performance Test.

- 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 confirming all traffic is able to transverse the network under full load with the SLA parameters.

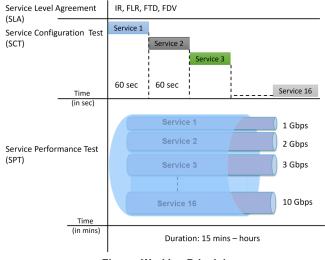


Figure: Working Principle

Service Configuration

The Service Configuration Summary provides a quick overview of all the configured parameters, allowing users to view the settings at a glance. Each Service can be configured for various attributes like the Frame Size(s), Header Parameters (including VLAN Tag Information), the Bandwidth profile (CIR, EIR and Policing Rates), Color Method and Service Level Agreements (SLA) parameters.

VICE	Name Svc1 Svc2 Svc3 Svc4		Summary Frame Size Layer MAC	VLAN MPLS IP UDP SLA Parameters	Payload Bandwidth Profile Co	Specific SAM1
# 1 2 3 4 5	Svc1 Svc2 Svc3 Svc4		Summary Frame Size Layer MAC		Payload Bandwidth Profile Co	lor Aware
2 3 4	Svc2 Svc3 Svc4			SLA Parameters		
3	Svc3 Svc4					
4	Svc4					
				Svc1 Configuration		
		G 8	Burnhalter		01-14	
			Description Frame Size	Left Type-Fixed [86]	Right Type-Fixed [100]	
· .	Svc5		Layer	UDP	UDP	
5	Svc6		MAC			
7			Source MAC Address	00-0D-E9-09-72-05 (HW MAC Address)	00-0D-E9-09-72-06	
	Svc7	2	Destination MAC Address	00-0D-E9-09-72-06	00-0D-E9-09-72-05	
	Svc8		Len/Type	08-00	08-00	
,	Svc9		VLAN	Disabled	Disabled	
'	2409		MPLS	Disabled	Disabled	
10	Svc10		IP ID Coloritor	10.4	10.4	
11	Svc11		IP Selection Source IP Address	IPv4 192.168.1.11	IPv4 192.168.1.12	
			Destination IP Address	192.168.1.11	192.168.1.12	
12	Svc12		Default Gateway	192.168.1.12	192.168.1.1	
13	Svc13		Subnet Mask	255.255.255.0	255.255.255.0	
			TTL	128	128	
14	Svc14		ToS/DS	0	0	
15	Svc15		Protocol	17	17	
16	Svc16		Header Checksum	Auto	Auto	
10	37010		Identification	Auto	Auto	
			UDP			
			Source UDP	1001	1002	
			Destination UDP	1002	1001	
			Checksum Payload	Auto	Auto	
			Payload	AB-CD	AB-CD	
			Bandwidth Profile	A0-00	ADGD	
			CIB	5 %	5 %	
			EIR	10 %	10 %	
			Traffic Policing Rate	20 %	20 %	
			Color Aware			
			Color Aware Enable	Disabled	Disabled	
			SLA Parameters			
			Frame Loss	10 %	10 %	
			Frame Transfer Delay Frame Delay Variation	12 msec 0.012 msec	12 msec 0.012 msec	

Figure: Service Configuration Summary



Ethernet VLAN C-TAG Configuration

User can enable VLAN configuration and set the C-Tag (Customer Tag) and S-Tag (Service Tag) VLAN Type, ID, and Priority.

The two byte VLAN segment Tag Control Information (TCI) includes 3 bit Carry Priority Information (PCP) field which indicates traffic priorities, which the user can configure.

		Svc1 (Configurati	ion
VLAN Enable				
	Туре		Id	Priority
C-Tag	81-00	•	0	0
S-Tag	81-00	•	0	0

Figure: VLAN C-Tag Configuration

Bandwidth (BW) Profile Configuration

Customer traffic is classified into three classes, and each is assigned a specific color:

- Committed information rate (CIR), or green traffic: guaranteed bandwidth available at all times for a specific service
- Excess information rate (EIR), or yellow traffic: excess bandwidth above CIR that may be available depending on network usage
- **Traffic Policing, or yellow traffic:** traffic exceeding the CIR or CIR/EIR rate that cannot be forwarded without impacting other services is classified as yellow traffic and is subsequently discarded.

	Svc1 Config	guration		Symmetrical Asymmetrical
	Left ← Rate Unit CIR EIR Traffic Policing Rate	 Right % 5 % 10 % 20 % 		
% of CIR		Best effort bandw	dth (everything ove vidth (everything be width (everything v	etween CIR and EIR)

Figure: Bandwidth Profile Configuration

VLAN C-Tag Color Method Configuration

Color aware is a bandwidth profile property where a pre-determined level of bandwidth profile compliance for each service frame is taken into account when determining the level of compliance for each service frame.

The VLAN C-Tag PCP field is assigned priority level from 1 to 4 to be considered as green frames equivalent to CIR and priority level from 5 to 7 to be considered as yellow frames equivalent to EIR.

Summary Frame Size Layer	MAC VLAN MPLS IP UDP Payload Bandwidth Profile Color Aware SLA Parameters
	Svc1 Configuration
	Color Aware Enable
	Color Method VLAN C-Tag PCP 🔻
	Green Frames 1
	Yellow Frames 2

Figure: VLAN C-Tag PCP Color Method Configuration

SLA Parameter Configuration

The SLA (Service Level Agreement) defines the requirements for the network path under test, including Frame Transfer Delay (FTD), Frame Delay Variation (FDV), and Frame Loss Ratio (FLR).

- **FLR**: FLR parameter is typically expressed as a ratio, this is a measurement of the number of packets lost over the total number of packets sent. The Parameter is configured in % units.
- **FTD**: FTD parameter is **also** known as latency, this is a measurement of the time delay between the transmission and the reception of a frame. The parameter is configured in msec units.
- **FDV**: FDV parameter is also known as packet jitter, this is a measurement of the variations in the time delay between packet deliveries. The parameter is configured in msec units.

Summary Frame Size Layer MAC VLAN MPLS IP	UDP	Payload	Bandwidth Profile	Color Aware	LA Parameters
Svc1 Configurat	tion			Symmetrical	Asymmetrical
Left <-> Right	t				
Z Frame Loss	10 %				
Frame Transfer Delay	12	msec 🔻			
Frame Delay Variation	0.012	msec 🔻			

Figure: SLA Parameter Configuration



Service Selection

Service selection enables user to choose any configured service or all available services (up to 16) for testing. The SLA parameters are measured and compared to the configured values for each service to validate the guaranteed traffic. Additionally, users can modify the necessary configurations as needed.

evices Ports ExpertS ummary Service Configu II Port Statistics Event Lo	ration Service	e Selection Tr	est Configur	ation Serv	ce Configu	ration Res	ults Service Perf	formance Results	Graphs	Load Save
Service Selection Available B	landwidth L 🌧 R	35.0000	% R⇒L	35.0000	8		Y.1564 Specific	: ← →	SAM1	Bandwidth_SLA
	Svc No.	Service Name	Direction	Frame Size	CIR (3)	FLR (%)	Max FTD (msec)	Max FDV (msec)	Edit	
	🖬 1	Svc1	L⇒R R⇒L	Fixed [86] Fixed [100]	5.0000 5.0000	10.000	12.000 12.000	0.012	8	
	2	Svc2	L⇒R	Fixed [100]	5.0000	10.000	12.000	0.012		
			R⇒L	Fixed [100]	5.0000	10.000	12.000	0.012	2	
	3	Svc3	R⇒L	Fixed [100]	5.0000	10.000	12.000	0.020		
	☑ 4	Svc4	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000 5.0000	10.000 10.000	12.000 12.000	0.020 0.020	8	
	☑ 5	Svc5	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000	10.000	12.000	0.012		
	6	Svc6	L⇒R	Fixed [100]	5.0000	10.000	12.000	0.012	8	
	0	5700	R⇒L	Fixed [100]	5.0000	10.000	12.000	0.012		
	7	Svc7	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000 5.0000	10.000	12.000 12.000	0.020 0.020	8	
	8 💟	Svc8	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000 5.0000	10.000 10.000	12.000 12.000	0.012	8	
	2 9	Svc9	L⇒R	Fixed [100]	5.0000	10.000	12.000	0.020		
	-		R⇒L	Fixed [100]	5.0000	10.000	12.000	0.020		
	2 10	Svc10	R⇒L	Fixed [100]	5.0000	10.000	12.000	0.020		
	2 11	Svc11	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000 5.0000	10.000 10.000	12.000 12.000	0.020 0.020	8	
	2 12	Svc12	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000	10.000	12.000	0.020	8	
	1 3	Svc13	L⇒R	Fixed [100]	5.0000	10.000	12.000	0.012		
			R⇒L	Fixed [100]	5.0000	10.000	12.000	0.012	8	
	0 14	Svc14	R⇒L	Fixed [100]	5.0000	10.000	12.000	0.012	(K)	
	□ 15	Svc15	L⇒R R⇒L	Fixed [100] Fixed [100]	5.0000 5.0000	10.000 10.000	12.000 12.000	0.012 0.012	8	
	16		L⇒R	Fixed [100]	5.0000	10.000	12.000	0.012	2	

Test Configuration

Figure: Service Selection

CIR, EIR and Traffic Policing are the three phases of Service Configuration Test performed per service sequentially, which can be configured in steps. The Service Configuration step is executed for each service within the specified step duration.

Once the configuration of each service is validated, the service performance test simultaneously validates the quality of all the services over the specified time duration.

evices Ports cummary Sei	ExpertSAM vice Configuration	Test Configuration	Service Configuration Results	Service Performan	ce Results	Load Save Graphs	
est Configuration	figuration Test uration Test R (@) Step Load CIF uration Test cing Test			20 25 ds CiR E Peliding	30	→ SAM1 •	
4	CIR						
6	Traffic Policir						

Figure: Test Configuration

Results

Result Summary:

The result summary offers a quick view of the test's overall outcome and status.

0 0	у												► Start Selected Stop Selected Repo					
	Co	onnection Status	Config	Start/Stop		Tes	st	Active	Service Ac	tive Step	Test Time	Rema	ining Time	Servic	e Configu	ration Verdi	ct Se	rvice Performance Ver
_	- Port2	• • •	٠	0	Serv	vice Perfor	mance Test				00:20:14	00	:00:00		×			~
			Tes	t Time 00:0	01:00	Through	put Gbps	▼ De	lay Unit mse	c 🔻 Ji	tter Unit u	isec 🔻	Vertical					
	Service N	Direction	Verdict	IR (Curr)	IR (Min)	IR (Avg)	IR FI (Max)	L Count	FL Rate (%)	FTD (Curr)	FTD (Min)	FTD (Avg)	FTD (Max)	FDV (Curr)	FDV (Min)	FDV (Avg)	FDV (Max)	
	Svc1	L→R R→L	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0	0.000	0.000	< 0.001 < 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000 0.000	0.000		0.084 0.096	
	Svc2	L → R R → L	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0	0.000	0.000	< 0.001 < 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000 0.000	0.000		0.100 0.096	
	Svc3	L → R R → L	Pass Pass	0.000 0.000	2.965 2.965	5.000 5.000	5.000 5.000	0 0	0.000	0.000 0.000	< 0.001 < 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000 0.000	0.000 0.000		0.096 0.096	
	Svc4	L⇒R R→L	Pass Pass	0.000 0.000	2.965 2.965	5.000 5.000	5.000 5.000	0 0	0.000 0.000	0.000 0.000	< 0.001 < 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000 0.000	0.000 0.000		0.100 0.100	
	Svc5	L→R R→L	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0	0.000	0.000	< 0.001 < 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000 0.000	0.000	< 0.01	0.096 0.100	
	Svc6	L⇒R R→L	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000	0	0.000	0.000	< 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000	0.000	< 0.01	0.096	
	Svc7	L→R R→L L→R	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0	0.000	0.000	< 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000	0.000	< 0.01	0.096	
	Svc8	L→R R→L	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0 0	0.000 0.000 0.000	0.000	< 0.001 < 0.001	< 0.001 < 0.001	< 0.001 < 0.001	0.000	0.000	< 0.01	0.096 0.096 0.100	
	Svc9	L→R R→L	Pass Pass Pass	0.000 0.000 0.000	2.965 2.965 2.965	5.000 5.000 5.000	5.000 5.000 5.000	0	0.000	0.000 0.000 0.000	< 0.001 < 0.001 < 0.001	< 0.001 < 0.001 < 0.001	< 0.001 < 0.001 < 0.001	0.000 0.000 0.000	0.000 0.000 0.000	< 0.01	0.096	
	Svc10	R→L L→R	Pass	0.000	2.965 2.965	5.000	5.000	0	0.000	0.000	< 0.001	< 0.001	< 0.001	0.000	0.000	< 0.01	0.096	
	Svc11 Svc12	R→L L→R	Pass	0.000	2.965 2.965	5.000	5.000	0	0.000	0.000	< 0.001	< 0.001	< 0.001	0.000	0.000	< 0.01	0.100	
	Svc12	R→L L→R	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0	0.000	0.000	< 0.001	< 0.001	< 0.001 < 0.001	0.000	0.000	< 0.01	0.096	
	Svc14	R→L L→R	Pass	0.000	2.965 2.965	5.000	5.000	0	0.000	0.000	< 0.001	< 0.001	< 0.001	0.000	0.000	< 0.01	0.096	
		R→L L→R	Pass Pass	0.000	2.965 2.965	5.000 5.000	5.000 5.000	0	0.000	0.000	< 0.001	< 0.001	< 0.001	0.000	0.000		0.092	

Figure: General Port Statistics



Service Configuration Test Results

The Service Configuration Results Overview pane displays the Service Name for which the test is running, the Verdict of the configuration test, Current Step of the service (CIR/EIR/Traffic Policing), Max IR (Mbps), FLR (%), Max FTD (msec), and Max FDV (msec) parameters for each configured service.

Each Service Configuration test result is detailed with IR (Mbps), FLR (%), FTD (msec), and FDV (msec) parameter measurement display. For each measured parameter, the min, mean and max values are displayed. Green and Yellow frames measurements are provided separately (for Color Aware mode). The verdict for each step for each service is reported after the completion of the test.

Summary Service	Configuration S	ervice Selec	tion Te	est Configuration	Service Co	nfiguratio	n Results	Service P	erformance F	Results	Graphs
Port Statistics All	Port Statistics E	vent Log									
ervice Configuration R	esults - 🌑			Overview	Details				Y.156	64 Specific	SAM1
Status - 😑			IR Gbp	ps ▼ FTD Unit	msec 🔻	FDV Unit	usec 🔻				
	Service Name	Direction	Verdict	FLR/FTD/FDV	Current Step	Max IR	FLR (%)	Max FTD	Max FDV		
	Svc1	L→R R→L	Pass Pass	•••	-	10.000 10.000	0.000	< 0.001 < 0.001	0.032 0.024		
	• Svc2	L⇒R R→L	Pass Pass	•••	-	10.000 10.000	0.000 0.000	< 0.001 < 0.001	0.020 0.020		
	Svc3	L→R R→L	Pass Pass	•••	-	10.000 10.000	0.000	< 0.001 < 0.001	0.132		
	Svc4	L→R R→L L→R	Pass Pass		-	10.000	0.000	< 0.001	0.020		
	• Svc5	R→L L→R	Pass Pass Pass	•••	-	10.000 10.000 10.000	0.000 0.000 0.000	< 0.001 < 0.001 < 0.001	0.024 0.136 0.124		
	Svc6	R→L L→R	Pass	•••	-	10.000	0.000	< 0.001	0.128		
	Svc7 Svc8	R→L L→R	Pass Pass	•••	-	10.000	0.000	< 0.001	0.020		
	• Svc9	R→L L→R R→L	Pass Pass		-	10.000	0.000	< 0.001	0.024		
	• Svc10		Pass Pass Pass		-	10.000 15.000 15.000	0.000	< 0.001 < 0.001 < 0.001	0.024		
	Svc11	L→R R→L	Pass Pass		-	10.000 10.000	0.000	< 0.001 < 0.001	0.024 0.024		
	• Svc12	L → R R → L	Pass Pass	•••	-	10.000 10.000	0.000 0.000	< 0.001 < 0.001	0.024 0.024		
	• Svc13	L→R R→L	Pass Pass	•••	-	10.000 10.000	0.000	< 0.001 < 0.001	0.024 0.024		
	Svc14	L⇒R R→L	Pass Pass	•••	-	10.000 10.000	0.000 0.000	< 0.001 < 0.001	0.024 0.024		
	Svc15	L → R R → L	Pass	•••	-	15.000	0.000	< 0.001 < 0.001	0.032		

Figure: Service Configuration Test Result- Overview

Service Performance Test Results

Once the configuration of each service is validated, the service performance test simultaneously validates the quality of all the services over time. The service performance results display includes all Key Performance Indicators (KPIs) parameter results for each service - IR, FLR, FTD, FDV (Current, Minimum, Mean, & Maximum).

ummary Service Cont ort Statistics All Port	figuration Servic Statistics Event	e Selection Log	Test Conf	figuration Ser	vice Confi	guration R	esults S	ervice Perfor	mance Results	Graphs
rvice Performance Results Status - 🔵	5 - •	IR Gbps	s v FT	Overview C	Details FDV Ur	iit usec	•	Q	Y.1564 Specifi	C SAM1
	Service Nam	Direction	Verdict	FLR/FTD/FDV	Max IR	FLR (%)	Max FTD	Max FDV		
	Svc1	L→R R→L	Pass Pass	:::	5.000 5.000	0.000	< 0.001 < 0.001	0.084		
	Svc2	L→R R→L	Pass Pass	•••	5.000 5.000	0.000 0.000	< 0.001 < 0.001	0.100 0.096		
	Svc3	L⇒R R→L	Pass Pass		5.000 5.000	0.000 0.000	< 0.001 < 0.001	0.096 0.096		
	Svc4	L→R R→L	Pass Pass	•••	5.000 5.000	0.000 0.000	< 0.001 < 0.001	0.100 0.100		
	Svc5	L→R R→L	Pass Pass		5.000 5.000	0.000	< 0.001 < 0.001	0.096		
	Svc6	L→R R→L L→R	Pass Pass		5.000 5.000	0.000 0.000 0.000	< 0.001 < 0.001	0.096		
	Svc7	R→L L→R	Pass Pass Pass		5.000 5.000 5.000	0.000	< 0.001 < 0.001 < 0.001	0.096 0.096 0.096		
	Svc8	R→L L→R	Pass	•••	5.000	0.000	< 0.001	0.096		
	Svc9 Svc10	R→L L→R	Pass Pass	•••	5.000 5.000	0.000	< 0.001 < 0.001	0.096		
	Svc10	R→L L→R	Pass Pass	•••	5.000	0.000	< 0.001	0.096		
	Svc12	R→L L→R R→L	Pass Pass Pass		5.000 5.000 5.000	0.000	< 0.001 < 0.001 < 0.001	0.100 0.096 0.096		
	Svc13	L→R R→L	Pass		5.000 5.000	0.000	< 0.001 < 0.001 < 0.001	0.104 0.096		
	Svc14	L→R R→L	Pass Pass		5.000 5.000	0.000	< 0.001 < 0.001	0.100		
		L → R	Pass		5.000	0.000	< 0.001	0.108		

Figure: Service Performance Test Result - ()

Port Statistics

Detailed statistics per port are provided, parameters include Frame Count, Frame Rate, Link Utilization, others are provided based on various categories like Frame Type (Unicast/Broadcast/Multicast, VLAN), frame lengths (64, 65-127, 1024-1518, Oversized, Undersized), Protocol Type (IPv4, IPv6, UDP, TCP, ICMP, IGRP, etc). VLAN Statistics (per Stack position), are also displayed for the configured stacks.

xetExpert ™ vices Ports ExpertSAM			ති Dashboard 📑 Serve	ers 🛗 Event Log 🖪 Adm Load Save
mmary Service Configuration rt Statistics All Port Statistics	Service Selection Event Log	Test Configuration	Service Configuration Results S	Service Performance Results Graphs
rt Statistics 🔹 Idle 🔅				Port1 V Reset
common Statistics		^	VLAN Statistics	^
Description	Тх	Rx	Description	Rx
Link Utilization (%)	0.000	0.000	1 Level Stacked VLAN Frames	561,379,798
Data Rate (Mbps)	0.000	0.000	2 Level Stacked VLAN Frames	0
Bad Frames	0	0	3 Level Stacked VLAN Frames	0
Non Test Frames	-	0		
FCS Error Frames	-	0	MPLS Statistics	^
IP Checksum Errors	-	0	Description	Rx
UDP Checksum Errors	-	0	1 Level Stacked MPLS Frames	0
Total Frames	8,967,724,525	8,892,786,472	2 Level Stacked MPLS Frames	0
Valid Frames	8,967,724,525	8,892,786,472	3 Level Stacked MPLS Frames	0
Number Of Bytes	887,874,045,220	889,278,647,200		
Frame Rate (frames/sec)	0	0	IP Statistics	^
			Description	Rx
Packet Type Statistics		~		0
			IP Checksum Errors	0
Description	Тх	Rx	IP Checksum Errors	8,892,786,472
	Tx	Rx 0		
Description			IPv4 Packets	8,892,786,472
Description Broadcast Frames	0	0	IPv4 Packets IPv6 Packets	8,892,786,472
Description Broadcast Frames Multicast Frames	0	0	IPv4 Packets IPv6 Packets TCP Packets	8,892,786,472 0 0
Description Broadcast Frames Multicast Frames Control Frames	0	0 0 0	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets	8,892,786,472 0 0 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames	000000000000000000000000000000000000000	0 0 561,379,798	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets	8,892,786,472 8,892,786,472 0 0 0 0 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames	000000000000000000000000000000000000000	0 0 561,379,798	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGRP Packets	8,892,786,472 8,892,786,472 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames	000000000000000000000000000000000000000	0 0 561,379,798 0	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGRP Packets	8,892,786,472 8,892,786,472 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames ength Statistics	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 561,379,798 0	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGRP Packets Other Protocol IP Packets	8,892,786,472 8,892,786,472 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames ength Statistics Description	0 0 635,600,520 0	0 0 561,379,798 0 Rx	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGRP Packets Other Protocol IP Packets UDP Statistics	8,892,786,472 8,892,786,472 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames ength Statistics Description Undersized Frames	0 0 0 635,600,520 0 Tx 0	0 0 561,379,798 0 Rx 0	IPv4 Packets IPv6 Packets ICMP Packets IGMP Packets IGMP Packets IGRP Packets UDP Statistics Description	8,892,786,472 8,892,786,472 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames Broadcast Frames Description Undersized Frames 64 Bytes Length	0 0 0 635,600,520 0 Tx 0 0	0 0 561,379,798 0 Rx 0 0	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGMP Packets Other Protocol IP Packets UDP Statistics Description UDP Checksum Errors	8,892,786,472 8,892,786,472 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames ength Statistics Description Undersized Frames 64 Bytes Length 65-127 Byte Length	0 0 0 635,600,520 0 7 x 0 0 0 8,967,724,525	0 0 561,379,798 0 Rx 0 8,892,786,472	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGMP Packets Other Protocol IP Packets UDP Statistics Description UDP Checksum Errors	8,892,786,472 8,892,786,472 0
Description Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames Broadcast Frames Description Undersized Frames 64 Bytes Length 65-127 Byte Length 128-255 Byte Length	 0 0 635,600,520 635,600,520 0 0 3 0 0 0 8,967,724,525 0 0 	0 0 561,379,798 0 Rx 0 8,892,786,472 0	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGMP Packets Other Protocol IP Packets UDP Statistics Description UDP Checksum Errors	8,892,786,472 8,892,786,472 0
Pescription Broadcast Frames Multicast Frames Control Frames VLAN Frames Pause Frames ergth Statistics Description Undersized Frames 64 Bytes Length 65-127 Byte Length 128-255 Byte Length 256-511 Bytes Length	 0 0 0 635,600,520 635,600,520 0 0 635,600,520 0 	0 0 561,379,798 0 ^ Rx 0 8,892,786,472 0 0	IPv4 Packets IPv6 Packets TCP Packets ICMP Packets IGMP Packets IGMP Packets Other Protocol IP Packets UDP Statistics Description UDP Checksum Errors	8,892,786,472 8,892,786,472 0

Figure: General Port Statistics

Graph

The graph illustrates test results for IR/FTD/FDV/Frame Loss with each of the 16 services represented by a unique color. Users can choose individual tests to view the corresponding graphs.

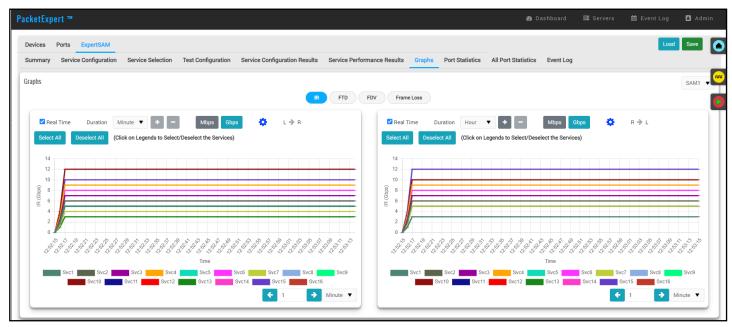


Figure: IR Graph

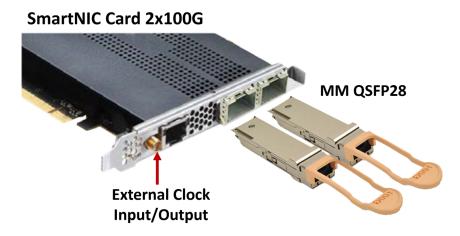
Report Generation

The Report Generation option allows to create detailed test report in PDF and CSV formats. This window lets the user configure the report file details.

Report Generation		×
Test Conducted By	Testers	Test Setup
Customer Name	GL Communications	SAM1
Operator Name	Admin	Generate Report Cancel
Title	PacketExpert 100G ExpertSAM (Y.1564) Rep	
Comments	ExpertSAM (Y.1564) Report	
Header	ExpertSAM (Y.1564) Report	
Footer		
Report Format	CSV	
File Name	ExpertSAM Report	

Figure: Report Generation

Hardware Specifications



PacketExpert[™] 100G SmartNIC

SmartNIC Specifications (Per Card)		
Optical Components	 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 	
PCle	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	0C to 45C	
Operating Humidity	20% to 80%	
Storage	-10 to 60C	
Oscillator Accuracy	+/- 4.6ppm	



Hardware Specifications (*Contd.*) PacketExpert[™] 100G Rack-mount Platforms

- Ideal for Lab environments that require centralized management of multiple servers and network devices
- Rack-mount units offer flexibility for scaling up or down as needed by adding or removing individual units

PacketExpert[™] 100G 4U Rack-mount



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

Specifications	
Dimensions	6.9" H x 16.9" W x 17.5" D
Weight	72 lbs.
Number of Supported Cards/Ports	Up to 7 Cards x (2x100G Ports), Maximum of 14 Ports
Power supply	800W

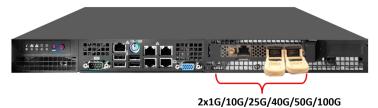
PacketExpert[™] 100G 2U Rack-mount



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

Specifications	
Dimensions	3.5" H x 17.2" W x 17.7" D
Weight	30 lbs.
Number of Supported Cards/Ports	Up to 2 Cards x (2x100G Ports), Maximum of 4 Ports
Power supply	800W

PacketExpert[™] 100G 1U Rack-mount



Specifications	
Dimensions	1.7" H x 17.2" W x 9.8" D
Weight	10 lbs.
Number of Supported Cards/Ports	1 x Full-height 1 Card x (2x100G Ports), Max- imum of 2 Ports
Power supply	200W

PacketExpert[™] 100G Portable Platforms

- Ideal for field engineers, military personnel, or researchers who need a powerful and portable computing solution in remote or rugged locations
- Suitable for environments where traditional desktops or laptops may be too fragile or lack necessary durability

Ultra-Portable PacketExpert[™] 100G (Lunchbox)



Specifications	
Dimensions	12.4" H x 16.41" W x 4.39" D
Display	17.3" 1920x1080
Weight	16.5 lbs.
Number of Supported Cards/Ports	Up to 2 Cards x (2x100G Ports), Maximum of 4 Ports
Power supply	400W (optional 500W)

Portable PacketExpert[™] 100G (Lunchbox)



Specifications	
Dimensions	13.62" H x 16.50" W x 7.25" D
Display	17.3″ 1920x1080
Weight	~23 lbs. (10.4kg)
Number of Supported Cards/Ports	Up to 3 Cards x (2x100G Ports), Maximum of 6 Ports
Power supply	680W 100/240VAC

PacketExpert[™] 100G Portable Platform (Lunchbox)



Specifications	
Dimensions	17.06" x 13.67" x 9.02" (H x W x D)
Display	17.3″ 1920x1080
Weight	~ 30 lbs.
Number of Supported Cards/Ports	Up to 6 Cards x (2x100G Ports), Maximum of 12 Ports
Power supply	1000W 100-240VAC

Buyer's Guide

Item No	Product Description
<u>PXX100</u>	PacketExpert™ 100G Platform (1G, 10G, 25G), All Port BERT, BERT/Loopback, RFC2544, Y.1564
<u>PXX101</u>	Basic Software (Required for PXX100)
<u>PXX103</u>	Additional 2-port card with Basic Software (Up to 4, 2-Port Cards (including the basic 2-Port Card) total per system for 8-Port testing; required for PXX107)
<u>PXX105</u>	40G, 50G, 100G Optional Software
<u>PXX106</u>	PacketExpert [™] 100 G – One card / 2 Port Platform with MM Kit
<u>PXX107</u>	PacketExpert [™] 100G - Two Card / 4 Port Portable Platform
PXX108	PacketExpert [™] 100 G – One card / 2 Port Platform with SM Kit
<u>PXX109</u>	Optional Software for CLI Support
<u>PXX110</u>	PacketExpert [™] 100 G - Two Card / 4 Port Platform with SM Kit
<u>PXX10X</u>	PacketExpert 100 G – 4 Card Platform / 8 Port Platform
Item No	Related Hardware and Software
<u>PXN100</u>	PacketExpert [™] 10GX
<u>PXN101</u>	10G option for PXN100

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more information, visit <u>PacketExpert[™] 100G- Comprehensive Ethernet/IP Testing Solution</u> webpage.



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A (Web) <u>www.gl.com</u> - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) <u>info@gl.com</u>