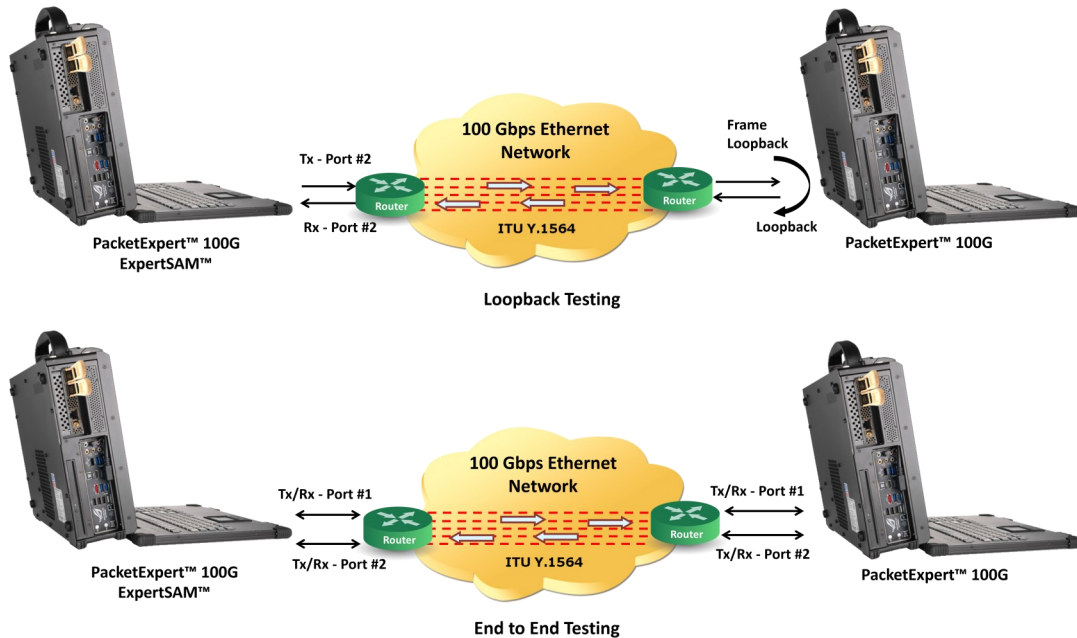


ExpertSAM™ - PacketExpert™ 100G

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 [PacketExpert™ - ExpertSAM™ \(ITU-T Y.1564\)](http://www.gl.com/PacketExpert-ExpertSAM-ITU-T-Y.1564) 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.



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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.

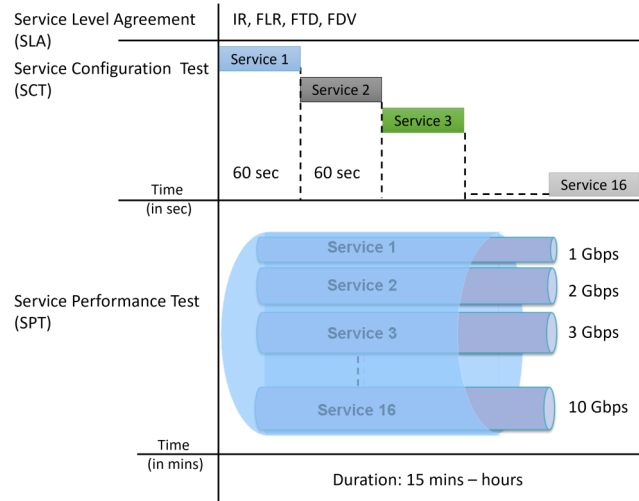


Figure: Working Principle

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.

Svc1 Configuration		
Description	Left	Right
Frame Size	Type-Fixed [86]	Type-Fixed [100]
Layer	UDP	UDP
MAC		
Source MAC Address	00-0D-E9-09-72-05 (HW MAC Address)	00-0D-E9-09-72-06
Destination MAC Address	00-0D-E9-09-72-06	00-0D-E9-09-72-05
Len/Type	08-00	08-00
VLAN	Disabled	Disabled
MPLS	Disabled	Disabled
IP		
IP Selection	IPv4	IPv4
Source IP Address	192.168.1.11	192.168.1.12
Destination IP Address	192.168.1.12	192.168.1.11
Default Gateway	192.168.1.1	192.168.1.1
Subnet Mask	255.255.255.0	255.255.255.0
TTL	128	128
ToS/DS	0	0
Protocol	17	17
Header Checksum	Auto	Auto
Identification	Auto	Auto
UDP		
Source UDP	1001	1002
Destination UDP	1002	1001
Checksum	Auto	Auto
Payload		
Payload	AB-CD	AB-CD
Bandwidth Profile		
CIR	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	12 msec	12 msec
Frame Delay Variation	0.012 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.

The screenshot shows the 'Svc1 Configuration' window. At the top, there is a toggle switch for 'VLAN Enable' which is turned on. Below this, there are two rows of configuration fields. The first row is for 'C-Tag' and the second row is for 'S-Tag'. Each row has a 'Type' dropdown menu (both set to '81-00'), an 'Id' input field (both set to '0'), and a 'Priority' input field (both set to '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.

The screenshot shows the 'Bandwidth Profile' configuration window. At the top, there are several tabs: Summary, Frame Size, Layer, MAC, VLAN, MPLS, IP, UDP, Payload, Bandwidth Profile (selected), Color Aware, and SLA Parameters. Below the tabs, there is a 'Svc1 Configuration' section. On the right side of this section, there are two buttons: 'Symmetrical' (selected) and 'Asymmetrical'. In the center, there is a 'Left <-> Right' configuration box. Inside this box, there is a 'Rate Unit' dropdown menu set to '%'. Below it, there are three input fields: 'CIR' set to '5', 'EIR' set to '10', and 'Traffic Policing Rate' set to '20'. Each input field has a '%' symbol next to it.

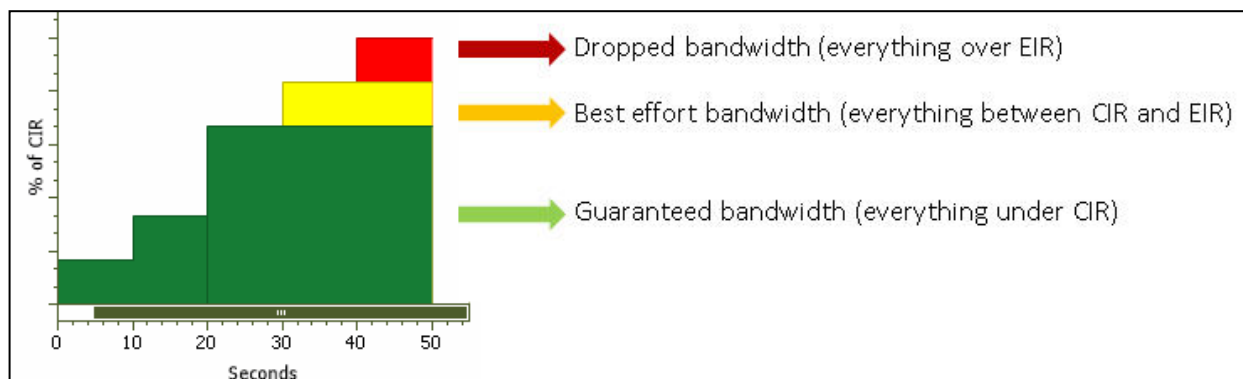


Figure: Bandwidth Profile Configuration

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.

The screenshot shows a configuration interface with tabs: Summary, Frame Size, Layer, MAC, VLAN, MPLS, IP, UDP, Payload, Bandwidth Profile, Color Aware (selected), and SLA Parameters. The 'Color Aware' tab is active, displaying the 'Svc1 Configuration' box. Inside this box, the 'Color Aware Enable' toggle is turned on. The 'Color Method' dropdown is set to 'VLAN C-Tag PCP'. Below this, 'Green Frames' is set to 1 and 'Yellow Frames' is set to 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.

The screenshot shows a configuration interface with tabs: Summary, Frame Size, Layer, MAC, VLAN, MPLS, IP, UDP, Payload, Bandwidth Profile, Color Aware, and SLA Parameters (selected). The 'SLA Parameters' tab is active, displaying the 'Svc1 Configuration' box. Inside this box, the 'Left <-> Right' section has three checked items: 'Frame Loss' set to 10 %, 'Frame Transfer Delay' set to 12 msec, and 'Frame Delay Variation' set to 0.012 msec. To the right of the configuration box, the 'Symmetrical' tab is selected over the 'Asymmetrical' tab.

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.

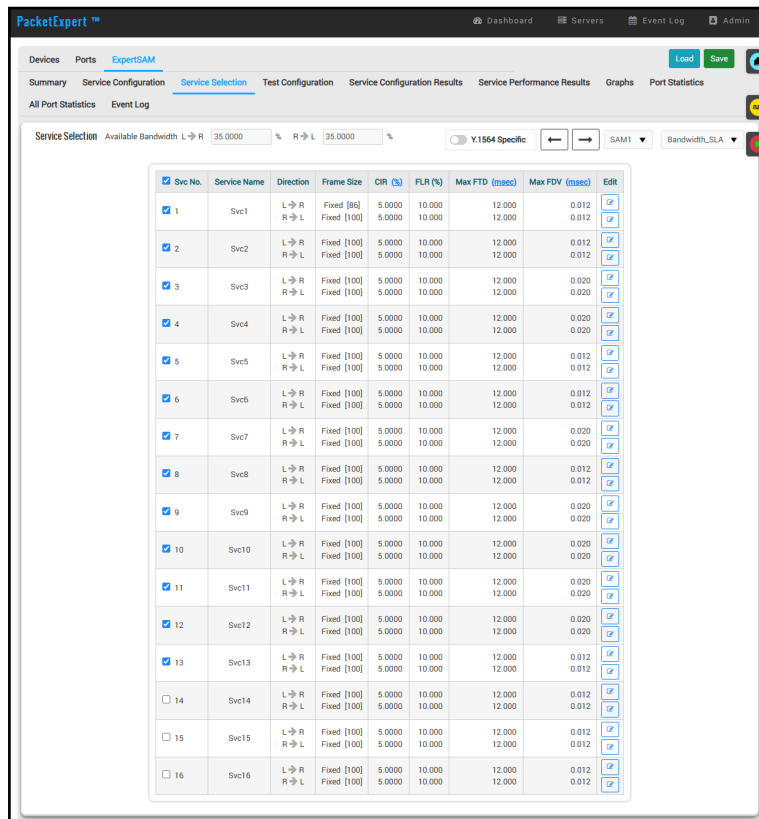


Figure: Service Selection

Test Configuration

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.

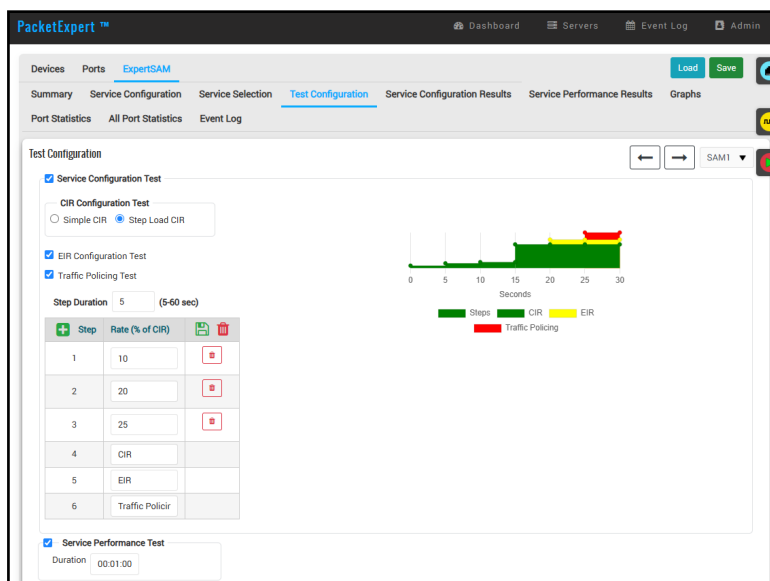


Figure: Test Configuration

Results

Result Summary:

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

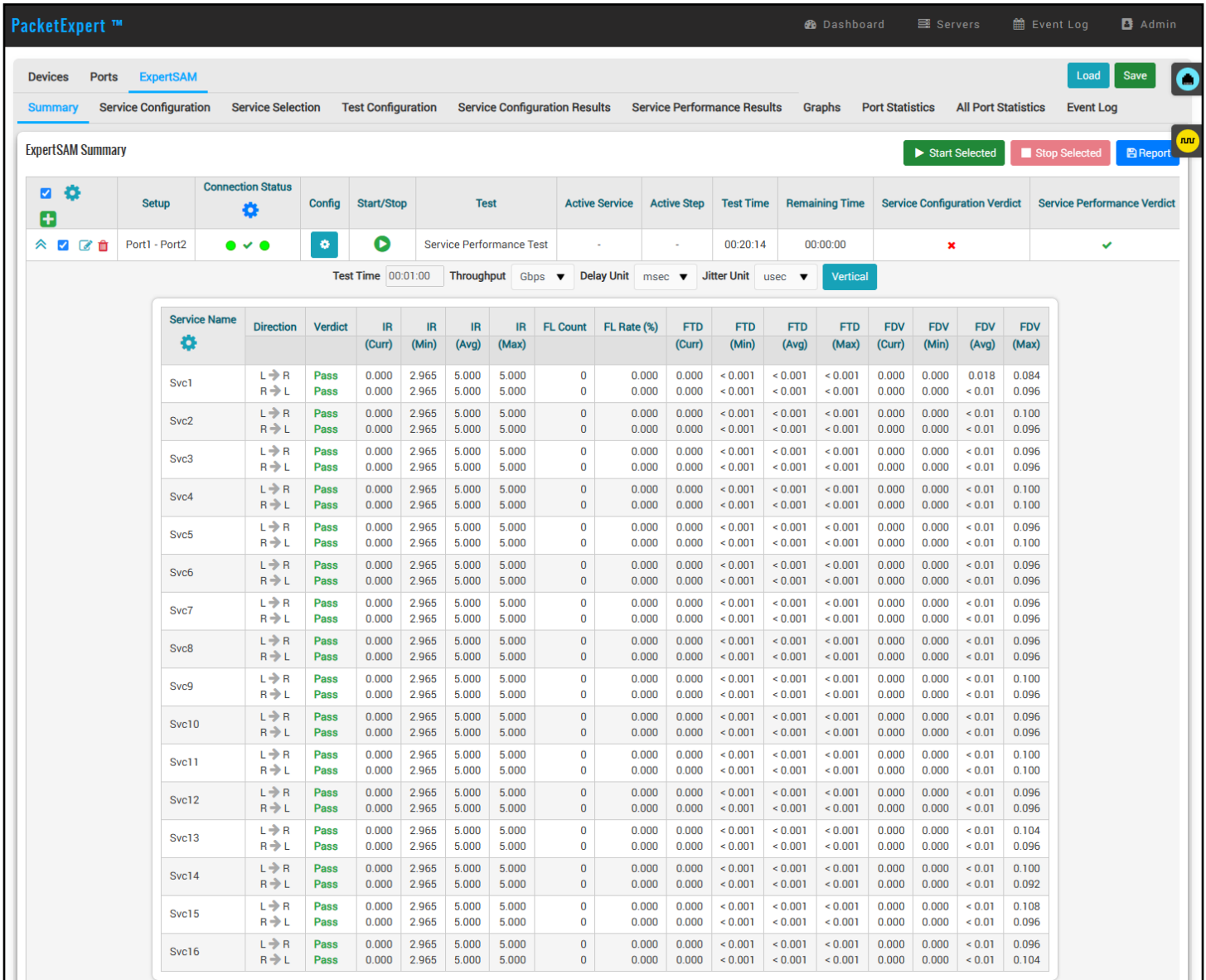


Figure: General Port Statistics

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.

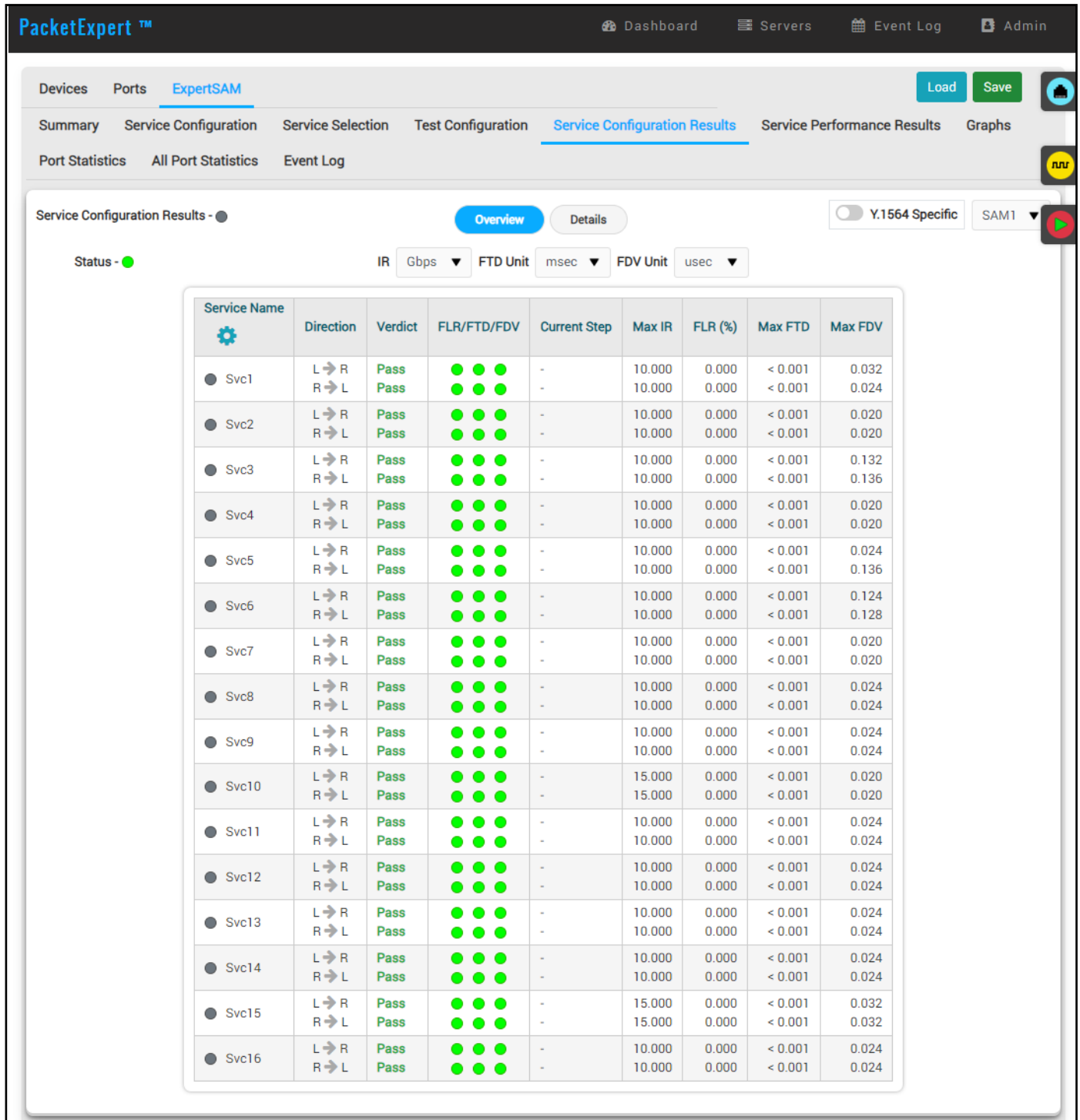


Figure: Service Configuration Test Result- Overview

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).

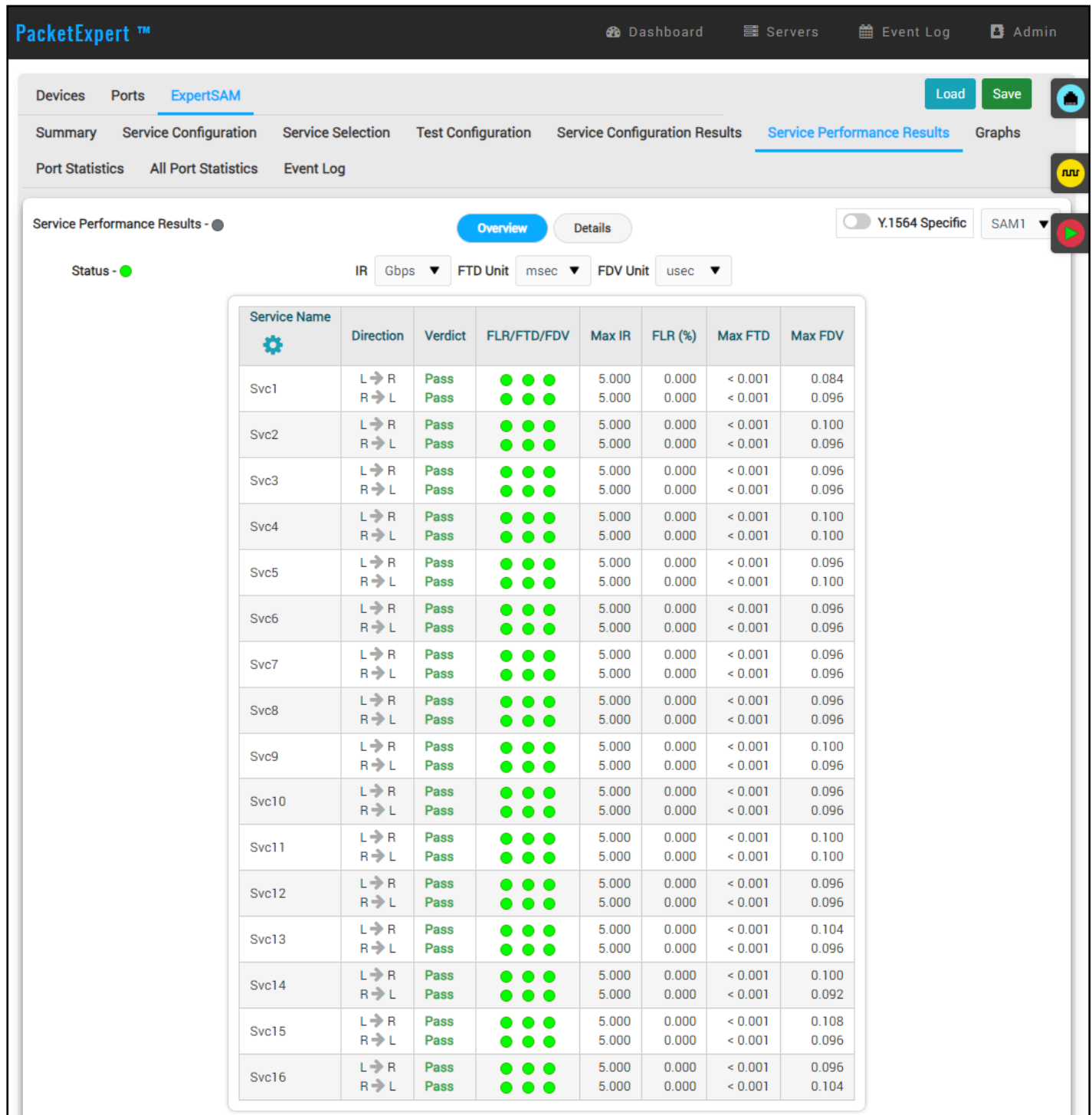


Figure: Service Performance Test Result - ()

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.

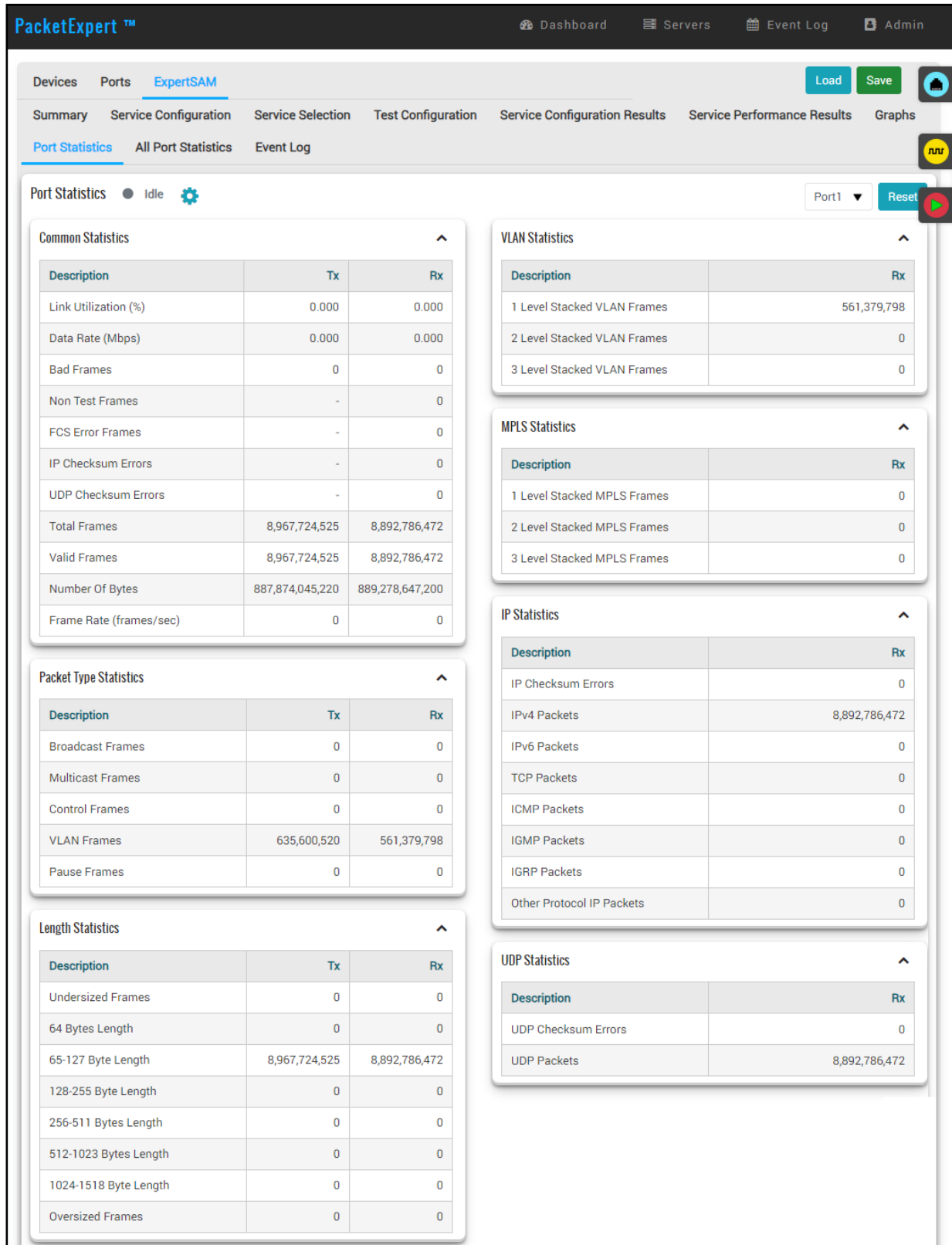


Figure: General Port Statistics

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.

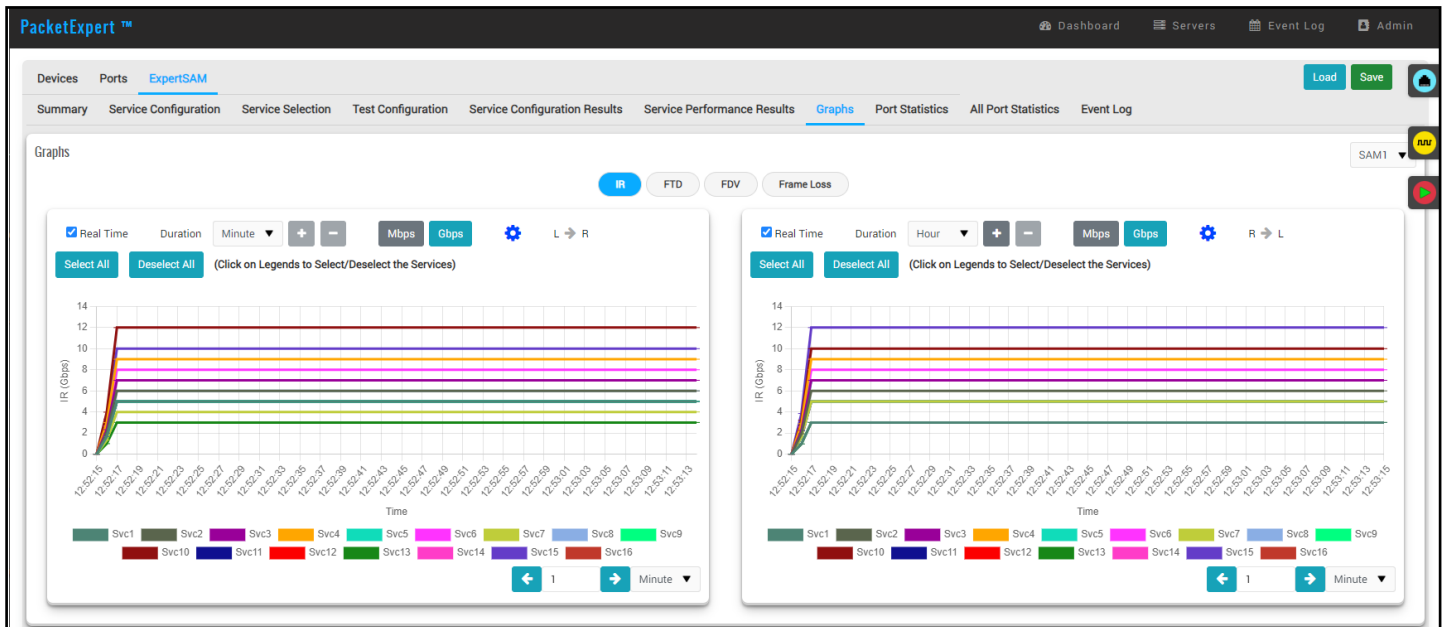


Figure: IR Graph

Report Generation

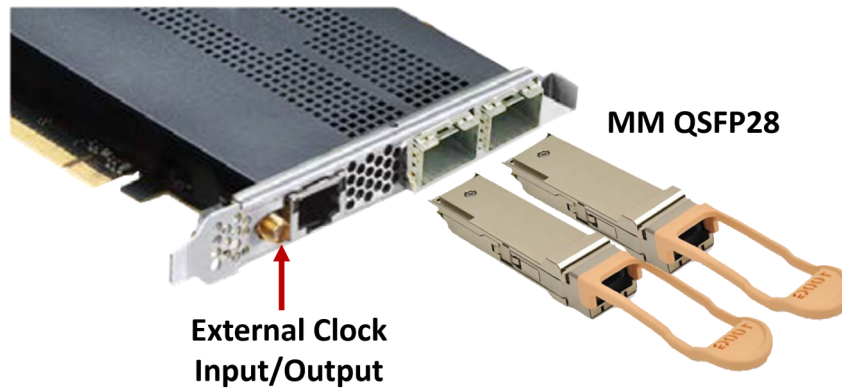
The Report Generation option allows to create detailed test report in PDF and CSV formats. This window lets the user configure the report file details.

The screenshot shows the 'Report Generation' window. It has a blue header with the title 'Report Generation' and a close button. The main area contains several input fields and a 'Test Setup' section. The 'Test Conducted By' field is set to 'Testers'. The 'Customer Name' field is set to 'GL Communications'. The 'Operator Name' field is set to 'Admin'. The 'Title' field is set to 'PacketExpert 100G ExpertSAM (Y.1564) Rep'. The 'Comments' field is set to 'ExpertSAM (Y.1564) Report'. The 'Header' field is set to 'ExpertSAM (Y.1564) Report'. The 'Footer' field is empty. The 'Report Format' dropdown is set to 'CSV'. The 'File Name' field is set to 'ExpertSAM Report'. The 'Test Setup' section has a checkbox for 'SAM1' which is checked. There are 'Generate Report' and 'Cancel' buttons at the bottom right.

Figure: Report Generation

Hardware Specifications

SmartNIC Card 2x100G



PacketExpert™ 100G SmartNIC

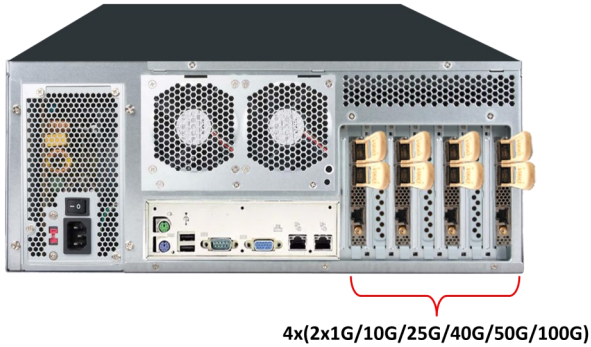
SmartNIC Specifications (Per Card)	
Optical Components	<ul style="list-style-type: none"> • 2 x QSFP28 cages for 2 x 100 GbE, 2 x 50GbE, and 2 x 40 GbE • Supports 2 x 25 GbE, 2 x 10 GbE, and 2 x 1 GbE with QSFP-to-SFP adapter
PCIe	PCIe Gen 3, 16 lanes
RAM	8 GBytes DDR4 SDRAM
1000Base-T Port	RJ45 for IEEE1588v2
Single-ended Coaxial I/O	SMA connector, 50 Ohms for External Clock Input/Output
Temperature Range	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



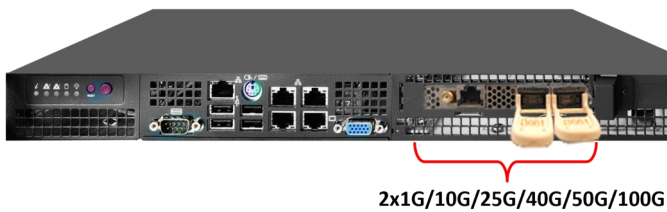
Specifications	
Dimensions	6.9" H x 16.9" W x 17.5" D
Weight	72 lbs.
Number of Supported Cards/Ports	Up to 7 Cards x (2x100G Ports), Maximum of 14 Ports
Power supply	800W

PacketExpert™ 100G 2U Rack-mount



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), Maximum of 2 Ports
Power supply	200W

PacketExpert™ 100G Portable Platforms

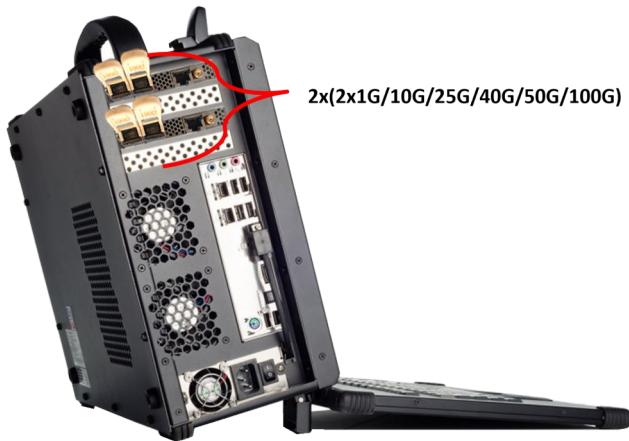
- Ideal for field engineers, military personnel, or researchers who need a powerful and portable computing solution in remote or rugged locations
- Suitable for environments where traditional desktops or laptops may be too fragile or lack necessary durability

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
PXX100	PacketExpert™ 100G Platform (1G, 10G, 25G), All Port BERT, BERT/Loopback, RFC2544, Y.1564
PXX101	Basic Software (Required for PXX100)
PXX103	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)
PXX105	40G, 50G, 100G Optional Software
PXX106	PacketExpert™ 100 G – One card / 2 Port Platform with MM Kit
PXX107	PacketExpert™ 100G - Two Card / 4 Port Portable Platform
PXX108	PacketExpert™ 100 G – One card / 2 Port Platform with SM Kit
PXX109	Optional Software for CLI Support
PXX110	PacketExpert™ 100 G - Two Card / 4 Port Platform with SM Kit
PXX10X	PacketExpert 100 G – 4 Card Platform / 8 Port Platform
Item No	Related Hardware and Software
PXN100	PacketExpert™ 10GX
PXN101	10G option for PXN100

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

For more information, visit [PacketExpert™ 100G- Comprehensive Ethernet/IP Testing Solution](#) webpage.



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