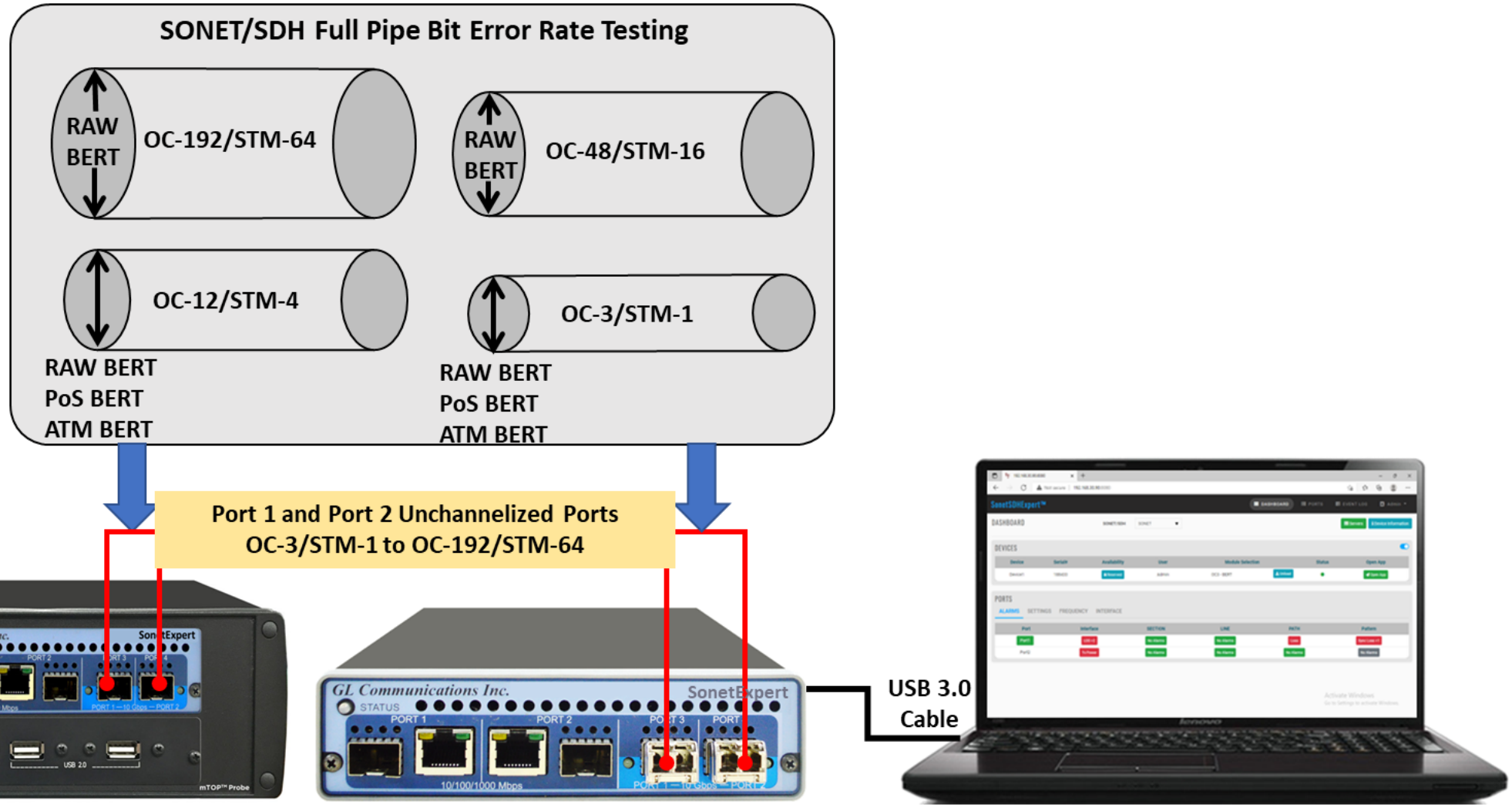
SonetExpert™ (SDH) Unchannelized Analyzer

OC-3/STM-1, OC-12/STM-4, OC-48/STM-1 and OC-192/STM-64

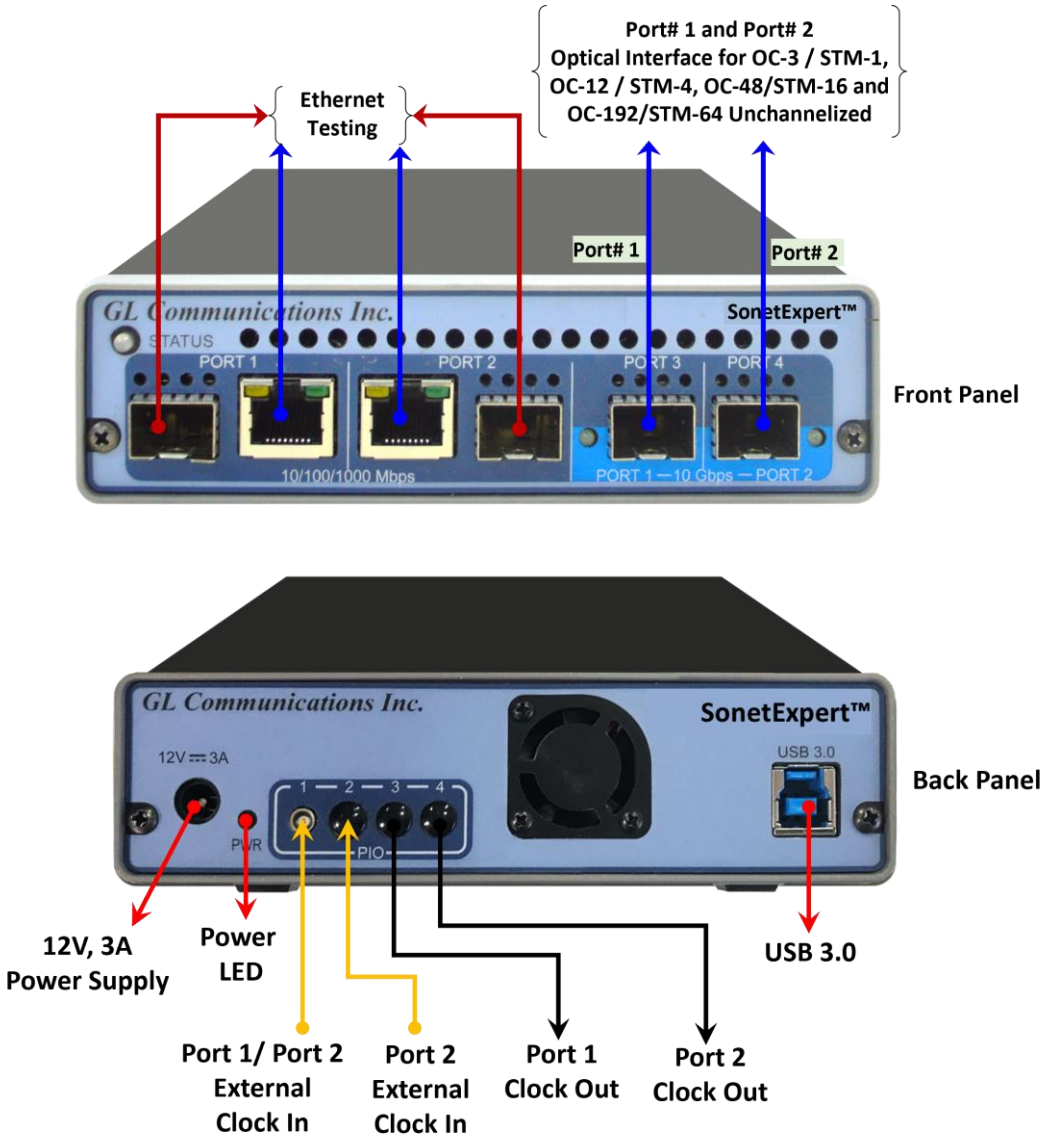
GL Communications Inc.
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: https://www.gl.com

SonetExpert™ Unchannelized Analyzer



GL Communications

SonetExpert™ Portable Hardware Specification

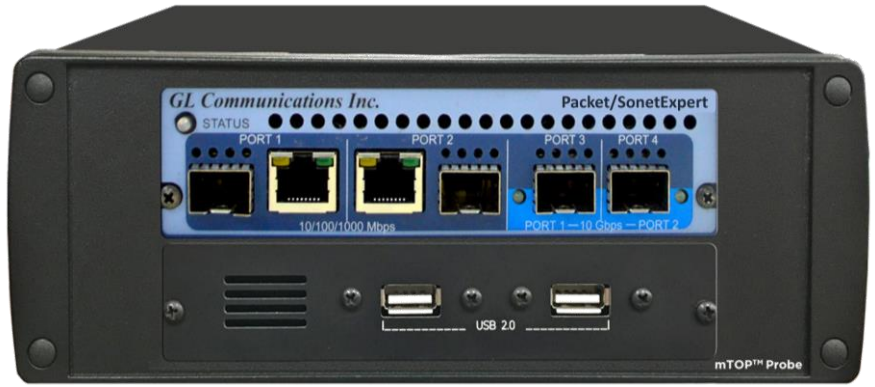


Interfaces	• 2 x Unchannelized Ports (OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, OC-192/STM-64) • Single Mode or Multi Mode Fiber SFP support with LC connector • USB 3.0 Port • External Clock: Input Port 1, Port 2 and Output Port 1, Port 2
T1/E1	• Sync Loss, HDB3 Violation, Carrier Loss, Frame Error, Remote, Distant MF, AIS, BPV Errors, CRC Errors, Frame Errors, Transmit Under Run, Receive Over Run
Dimensions	• Length: 8.45 in. (214.63 mm) • Width: 5.55 in. (140.97 mm) • Height: 1.60 in (40.64 mm)
External Power Supply	• +12 Volts (Medical Grade), 3 Amps

GL Communications

SonetExpert™ mTOP™ Probe Unit

- PacketExpert™ hardware is used for both PacketExpert /SonetExpert™



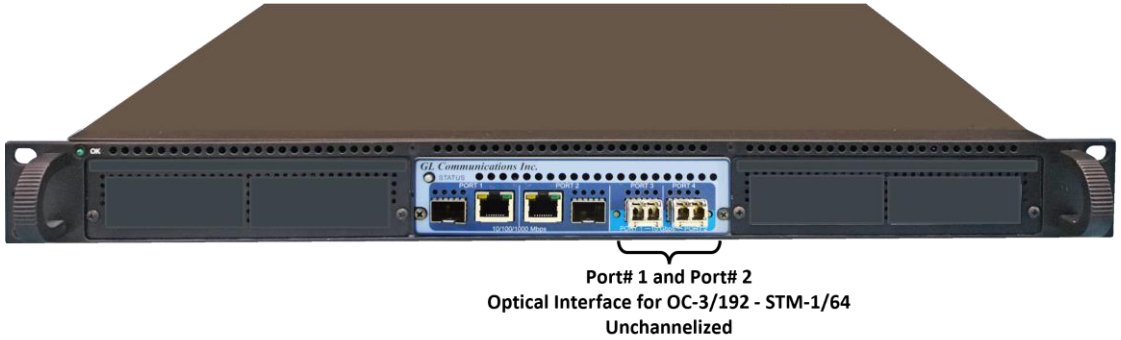
SonetExpert™ mTOP™ Probe Solution (Front Panel)

SonetExpert™ mTOP™ Probe Solution (Back Panel)

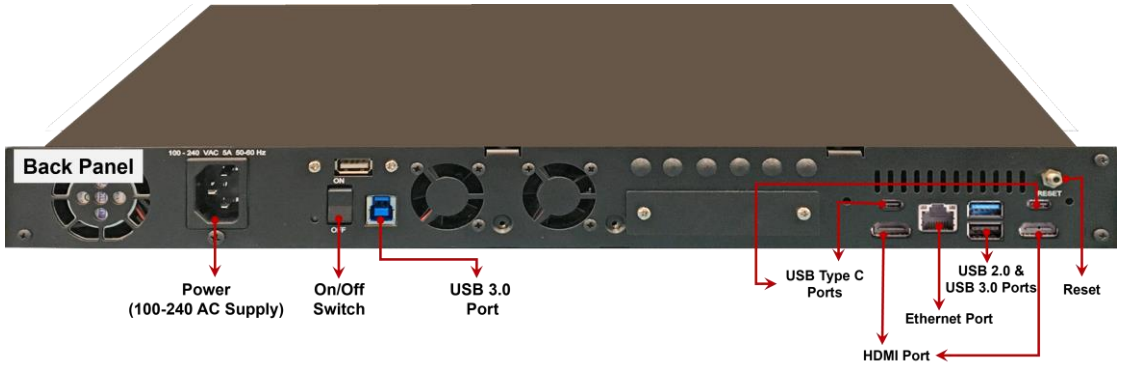
Physical Specifications	• Height: 3.0 Inches (76.2 mm) • Length: 10.4 Inches (264.16 mm) • Width: 8.4 Inches (213.36 mm)
SonetExpert™ interfaces	• 4x 1G Base-X Optical OR 10/100/1000 Base-T Electrical • 2x 10G Base-SR, -LR -ER Optical option • 2 x 100 Mbps Base-FX optical interface • Single Mode or Multi Mode Fiber SFP support with LC connector
External Power Supply	• +12 (Medical Grade), 3 Amps
SBC Specifications	• Intel Core i3 or optional i7 NUC Equivalent • Windows® 10 64-bit Pro Operating System • USB 2.0 or 3.0 Ports, ATX Power Supply • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports (Optional VGA to HDMI interface) • External USB based Wi-Fi adaptor

GL Communications

SonetExpert™ mTOP™ 1U Rack Solution



SonetExpert™ mTOP™ 1U Rack Solution (Front Panel)

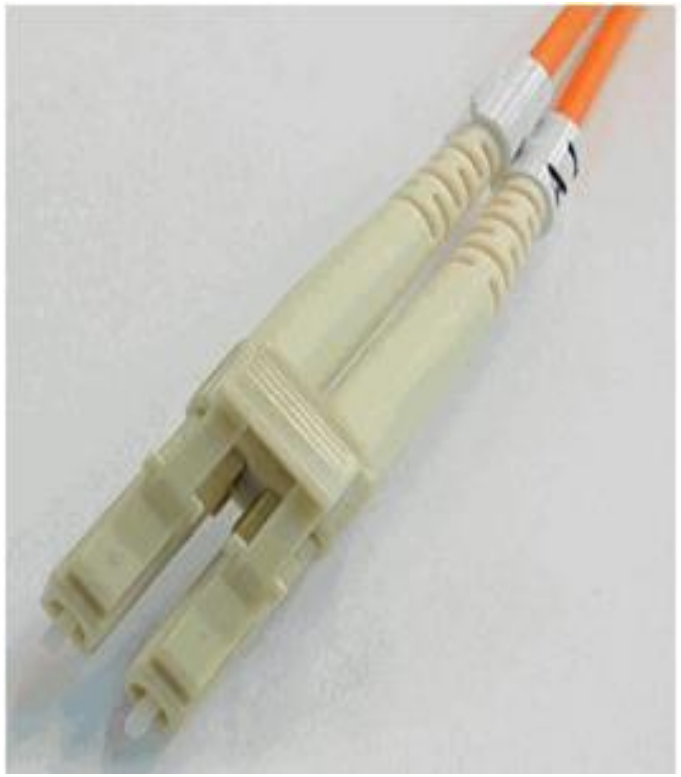


SonetExpert™ mTOP™ 1U Rack Solution (Back Panel)

Physical Specifications	• Height: 1U Rack • Length: 16 Inches • Width: 19 Inches
SonetExpert™ interfaces (1 unit)	• Two Unchannelized Ports (OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, OC-192/STM-64) • Single Mode or Multi Mode Fiber SFP support with LC connector
SBC Specifications	• Embedded SBC, 1x SonetExpert™ • Intel Core i7, Windows® 11 64-bit Pro Operating System • USB 3.0 and 2.0 Ports, ATX Power Supply • USB Type C ports, Ethernet 2.5GigE port • 225GB Hard drive, 8G Memory

GL Communications

Optical Connectors and SFP Modules



LC Connectors

1310 or 1550 nm SFP Module

GL Communications

Introduction

- SONET = Synchronous optical networking. Used in North America
- SDH = Synchronous digital hierarchy. Used in the rest of the world
- SONET and SDH are optical transmission protocols for high-speed data, voice and video traffic
- Data rates
  - **SONET**: Optical Carrier (OC) - N
  - **SDH**: Synchronous Transport Module (STM) - N
- SONET/SDH can carry channelized and unchannelized data
  - Channelized = T1 E1.
    - OC-3/STM-1 supports 84 T1s or 63 E1s
    - OC-12/STM-4 supports 336 T1s or 252 E1s
    - OC-48/STM-16 supports
    - OC-192/STM-64 supports
  - Unchannelized = Packet over SONET (PoS), Asynchronous Transfer Mode (ATM) and RAW Analyzer

SONET or SDH Line Rates

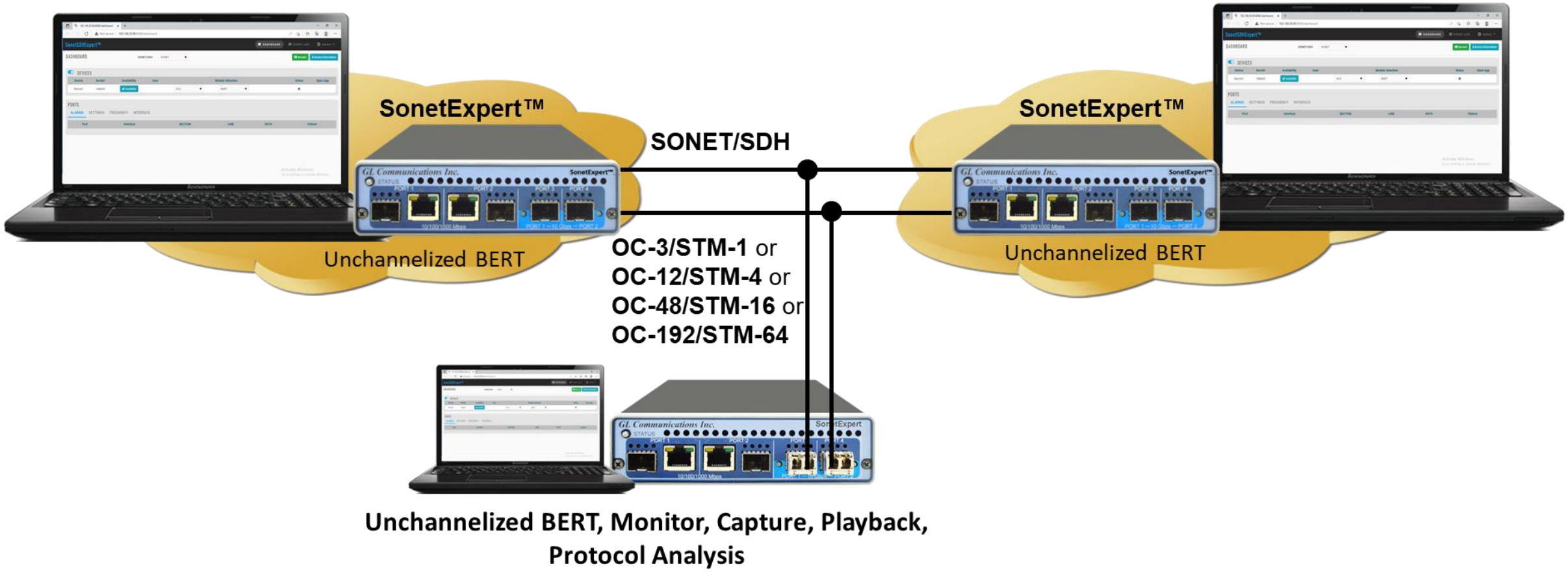
Electrical	Optical (SONET)	Line Rates	SDH Equivalent
STS-1	OC-1	51.84 Mbps	____
STS-3	OC-3	155.52 Mbps	STM-1
STS-9	OC-9	466.56 Mbps	____
STS-12	OC-12	622.08 Mbps	STM-4
STS-18	OC-18	933.12 Mbps	____
STS-24	OC-24	1.2 Gbps	____
STS-36	OC-36	1.9 Gbps	____
STS-48	OC-48	2.5 Gbps	STM-16
STS-96	OC-96	5 Gbps	____
STS-192	OC-192	10 Gbps	STM-64
STS-768	OC-768	40 Gbps	____
STS-3072	OC-3072	160 Gbps	____

Main Features

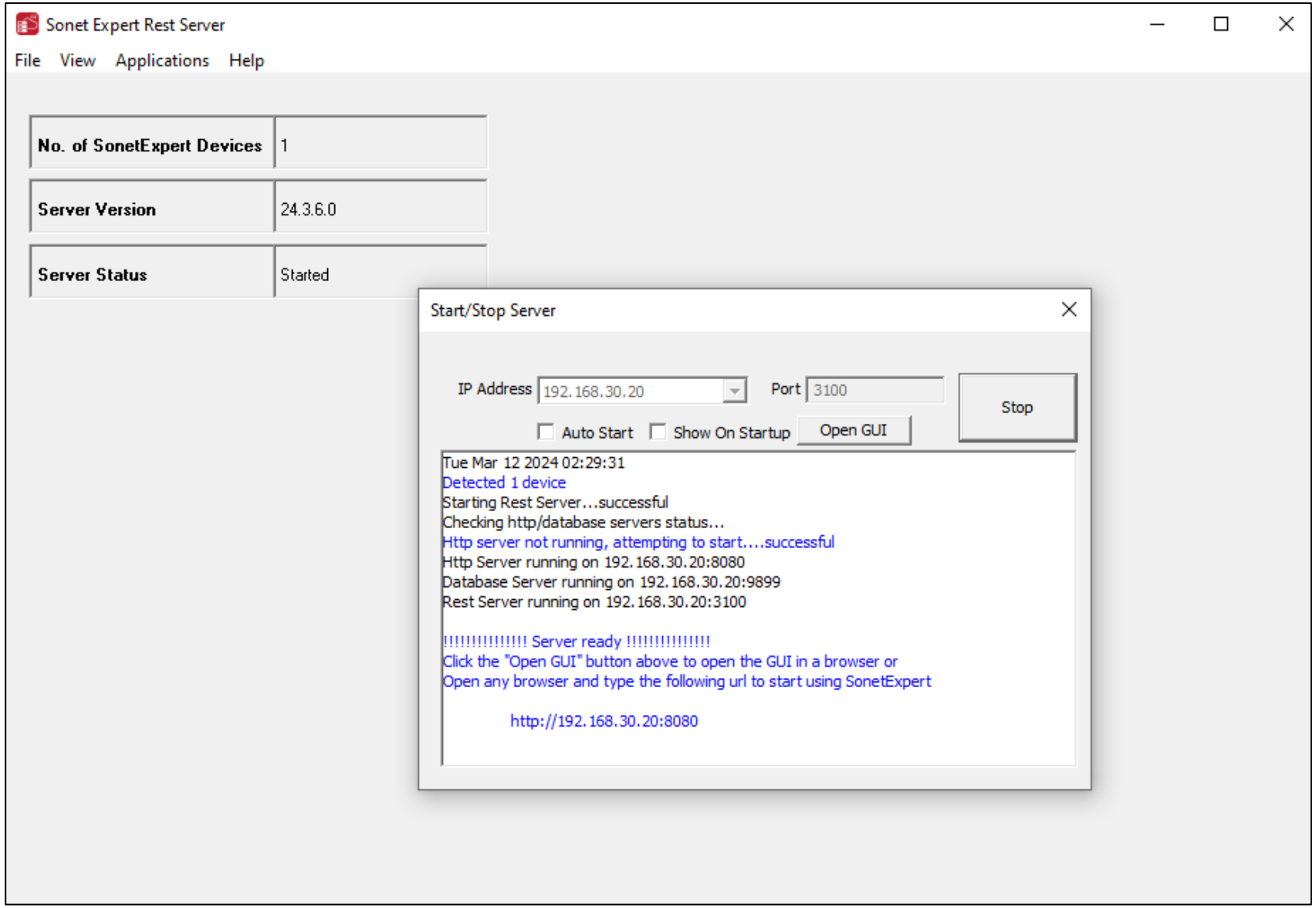
- Wirespeed processing of ATM, PoS or RAW data for Tx and Rx for both ports
- Supports BERT testing at rates from OC-3 to OC-192
- Ability to capture or playback to or from disk at full rate in both directions for all ports for detailed offline analysis
- Comprehensive transmit/receive testing capabilities; transmitting and verifying data with incrementing sequence numbers with each packet/cell
- Easy to use and flexible Bit Error Rate Test (BERT) application for ATM, POS and RAW Analyzers
- SCAN feature gives a complete overview of the incoming SONET/SDH traffic in an easy and intuitive graphical display and helps technicians to quickly identify the structure of unknown SONET/SDH traffic
- ATM (AAL2, AAL5) Protocol Analyzer, UMTS Protocol Analyzer, PPP (IP and higher layer protocols) Protocol Analyzer
- ATM
  - ATM Forum User Network Interface Specification
  - ATM physical layer for Broadband ISDN according to CCITT Recommendation I.432
- PPP over SONET (PoS)
  - Point-to-Point Protocol (PPP) over SONET/SDH specification according to RFC 2615 (1619) / 1662 of the PPP Working Group of the Internet Engineering Task Force (IETF)
- OC-3/OC-12/STM-1/STM-4 Transparent Payload
  - Analyzer processes SONET/SDH payload in transparent (RAW) mode without any transport protocols

SonetExpert™ SONET/SDH Unchannelized Analyzer

SonetExpert™ Unchannelized Setup



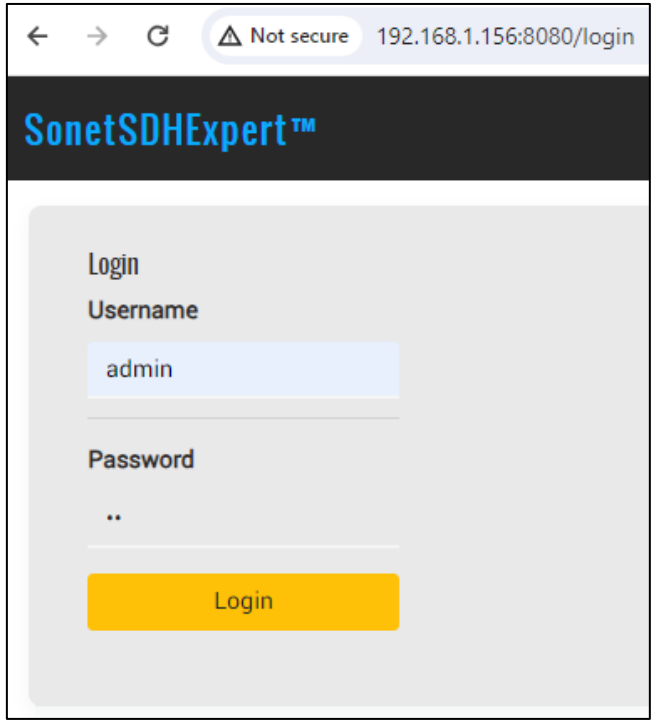
SonetExpert™ Rest Server



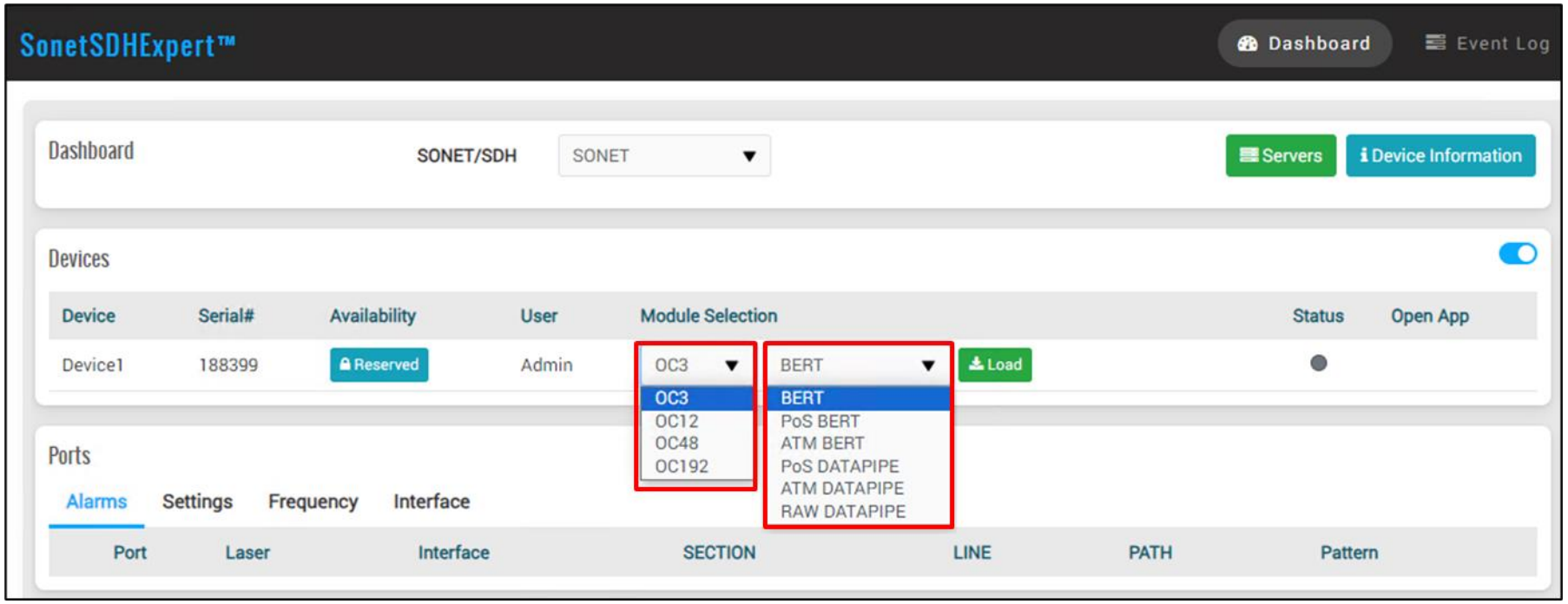
GL Communications

SonetExpert™ Unchannelized Web Interface

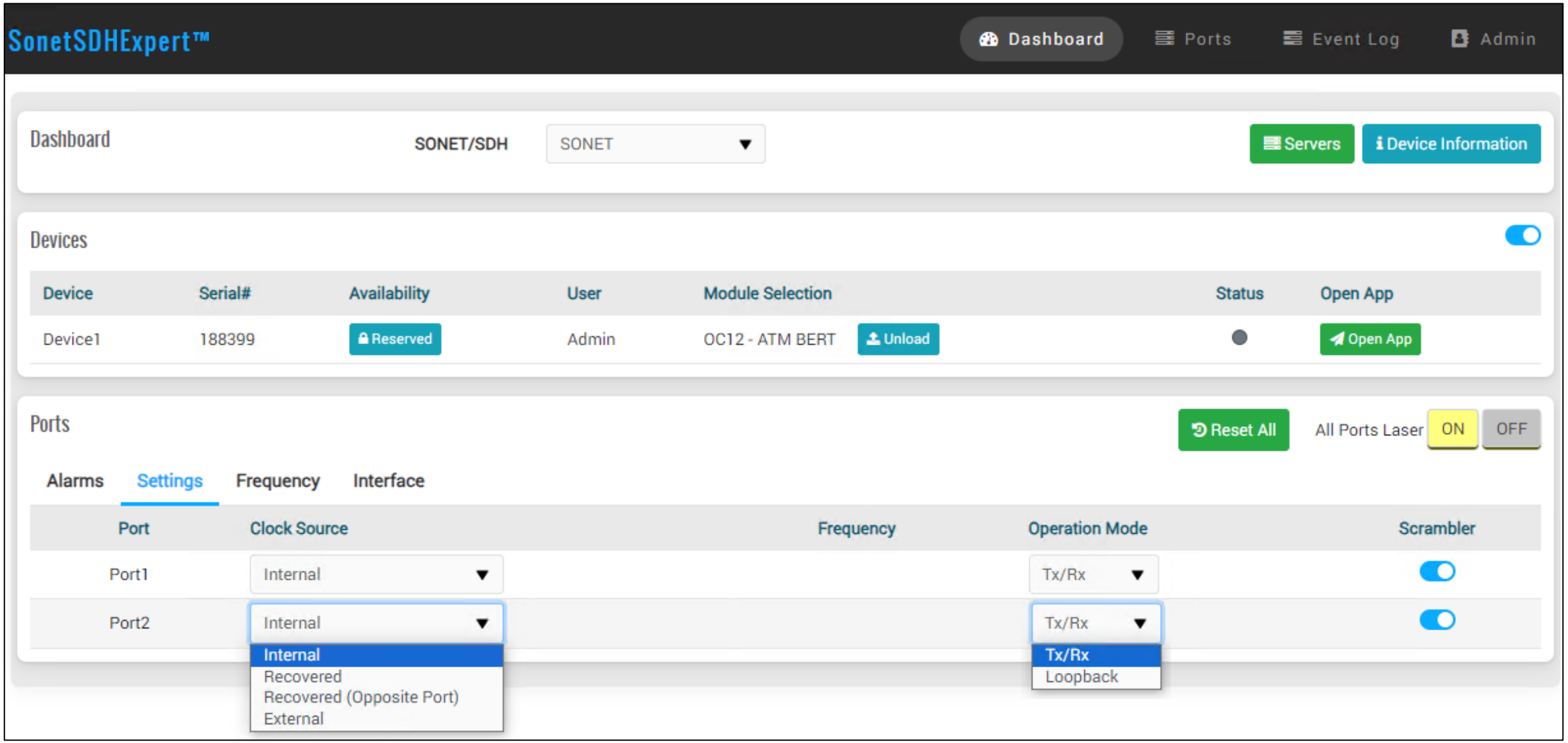
Login Page



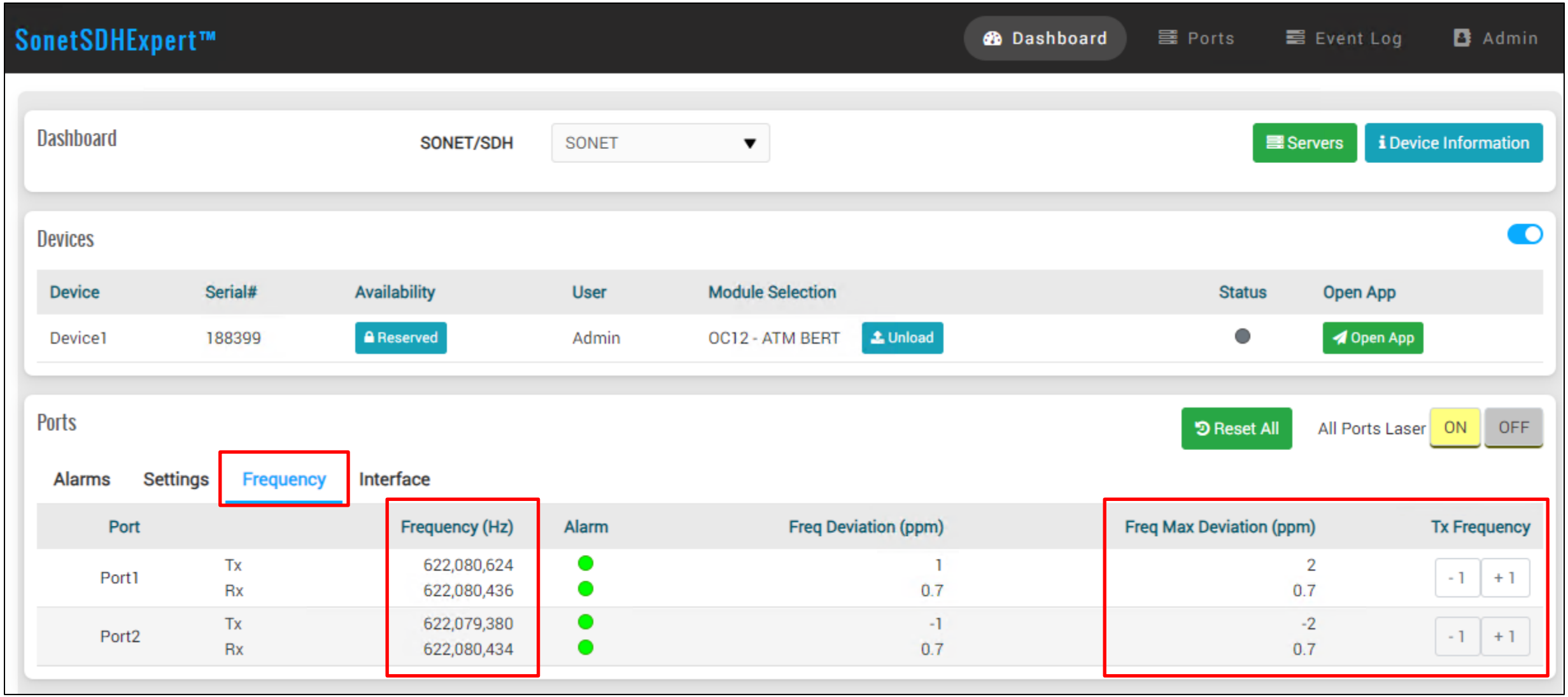
Web Client



Clock Source and Operation Mode

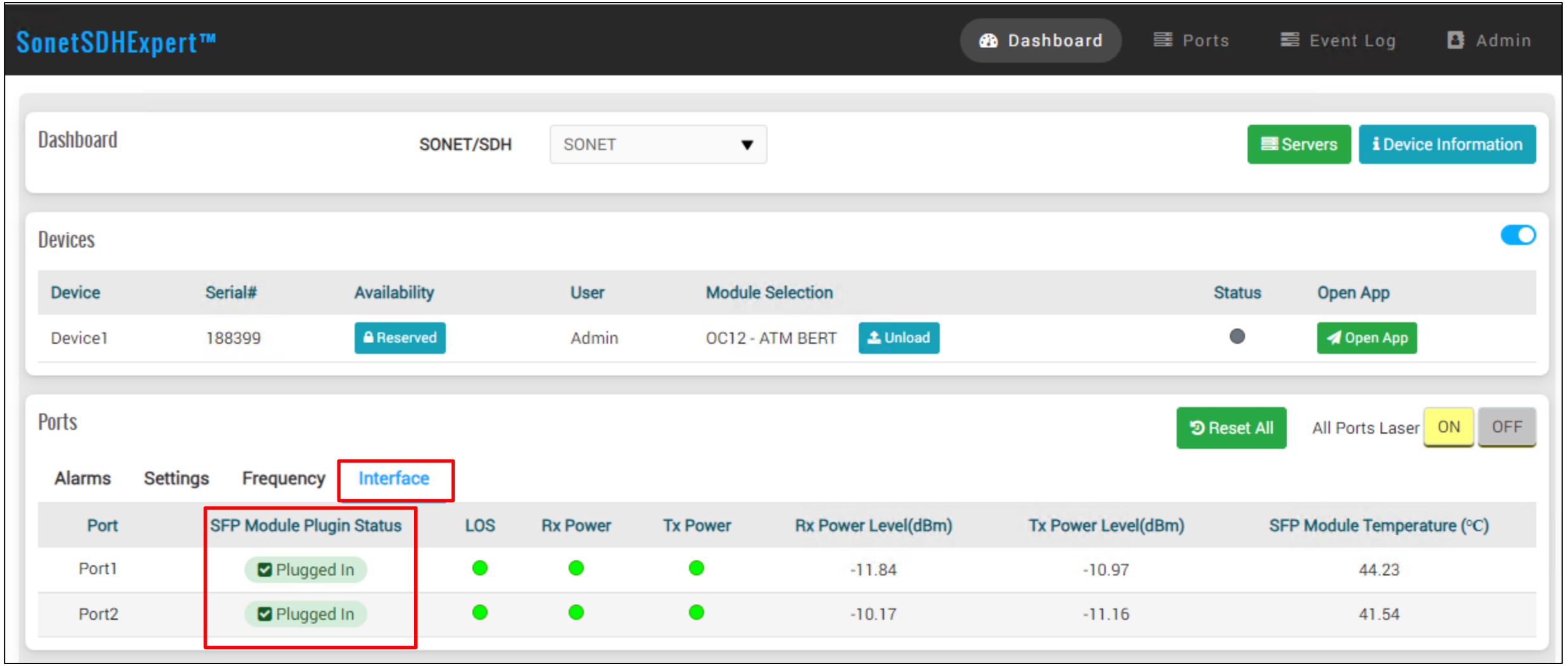


Tx Rx Frequency



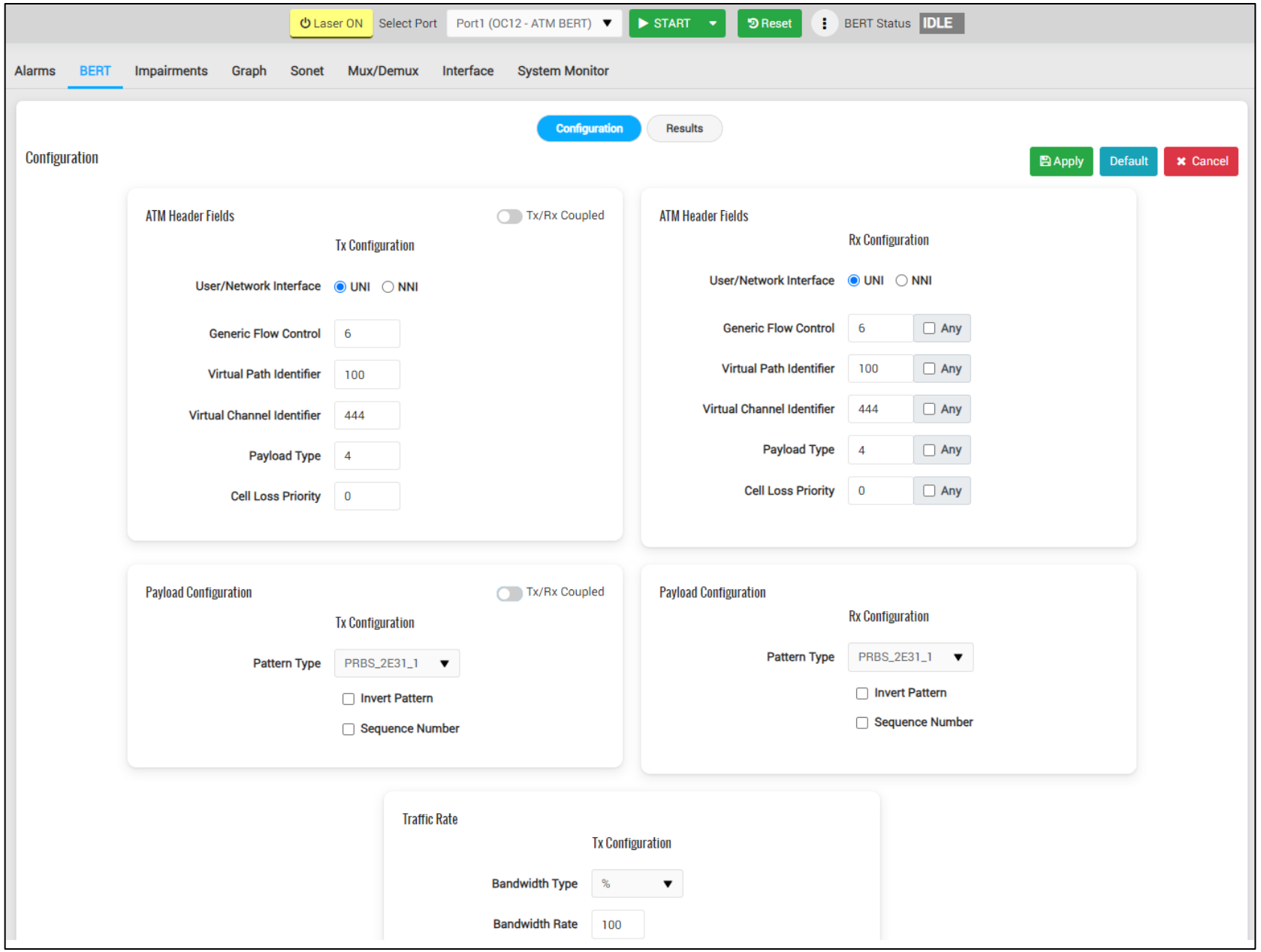
GL Communications

SFP Module Interfaces



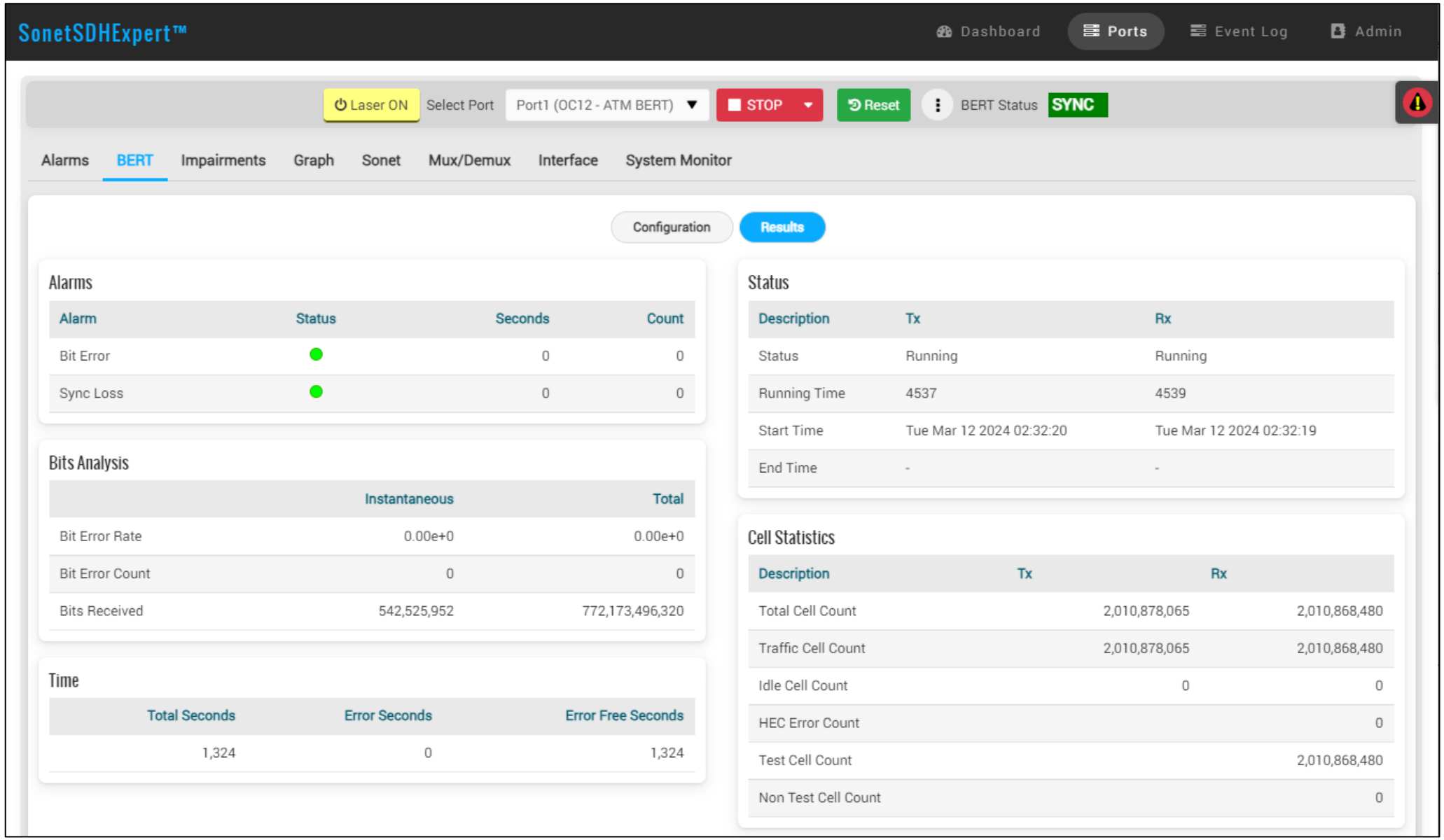
GL Communications

ATM BERT Configuration



GL Communications

BERT Results



GL Communications

Alarms/Error Monitoring

- Monitors and reports all SONET/SDH alarms → Section, Line, Path alarms (SONET) or RSOH, MSOH, HP alarms (SDH)

➢ **Section/RSOH Alarms**

SONET (Section)	SDH (RSOH)
Loss of Frame	
B1 BIP	
Out of Frame alarm	

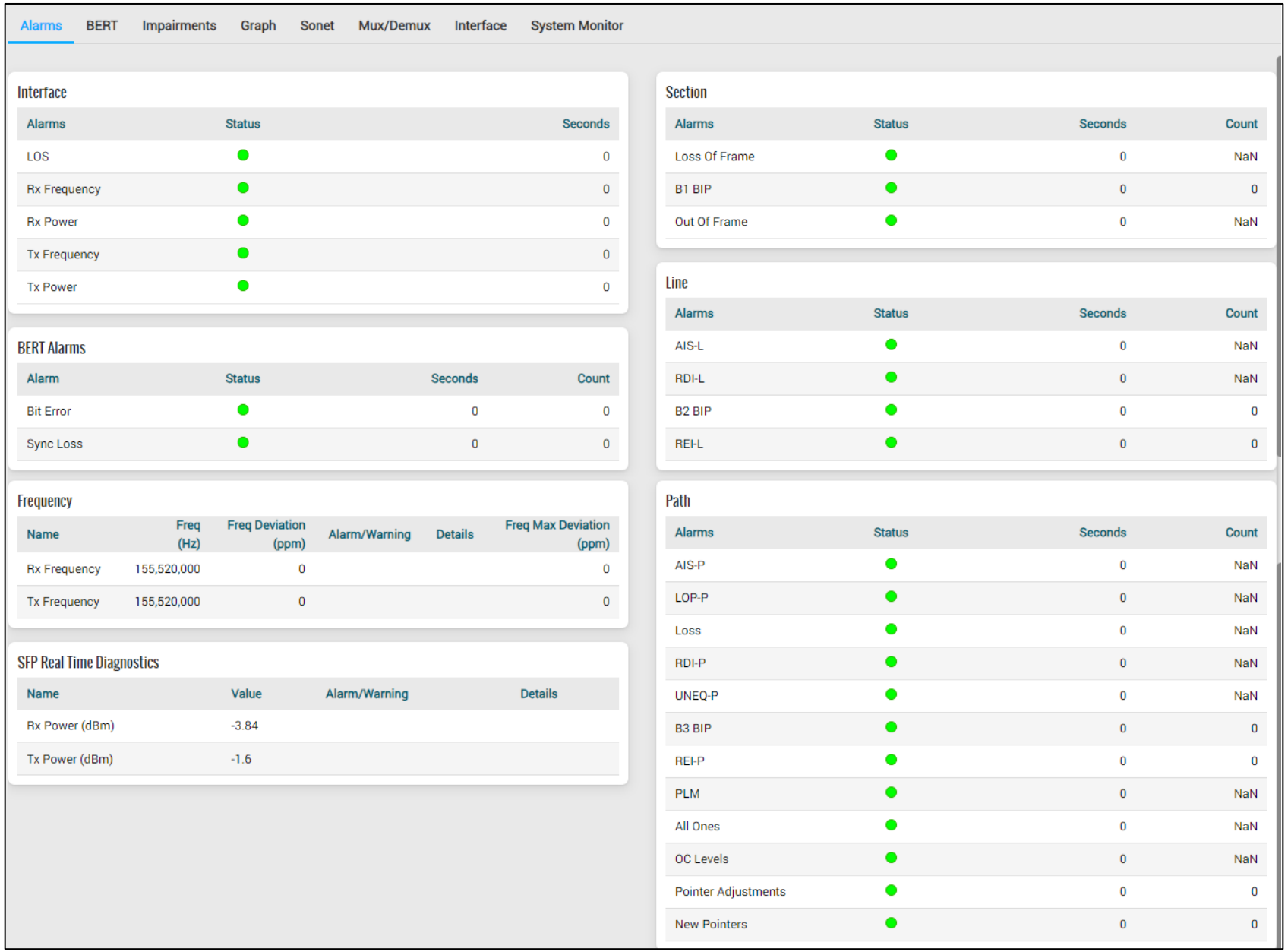
➢ **Line/MSOH Alarms**

SONET (Line)	SDH (MSOH)
AIS-L	MS-AIS
RDI-L	MS-RDI
B2 BIP	B2 BIP
REI-L	MS-REI

➢ **Path/HP Alarms**

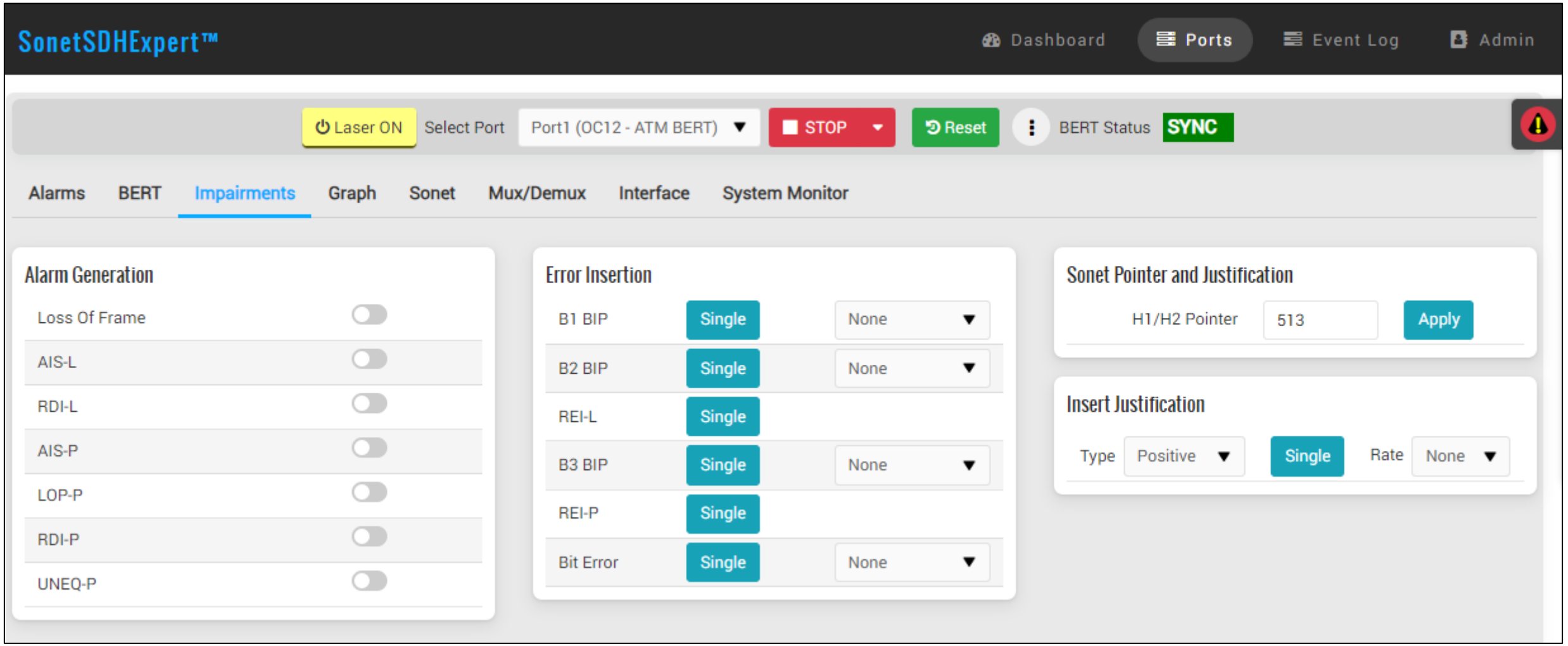
SONET (Path)	SDH (HP)
AIS-P	AU-AIS
LOP-P	AU-LOP
Loss	Loss
RDI-P	HP-RDI
UNEQ-P	HP-UNEQ
B3 BIP	B3 BIP
REI-P	HP-REI
PLM	PLM
All Ones	All Ones
OC Levels	STM Levels
Pointer Adjustment	
New Pointer	

SONET or SDH Alarms

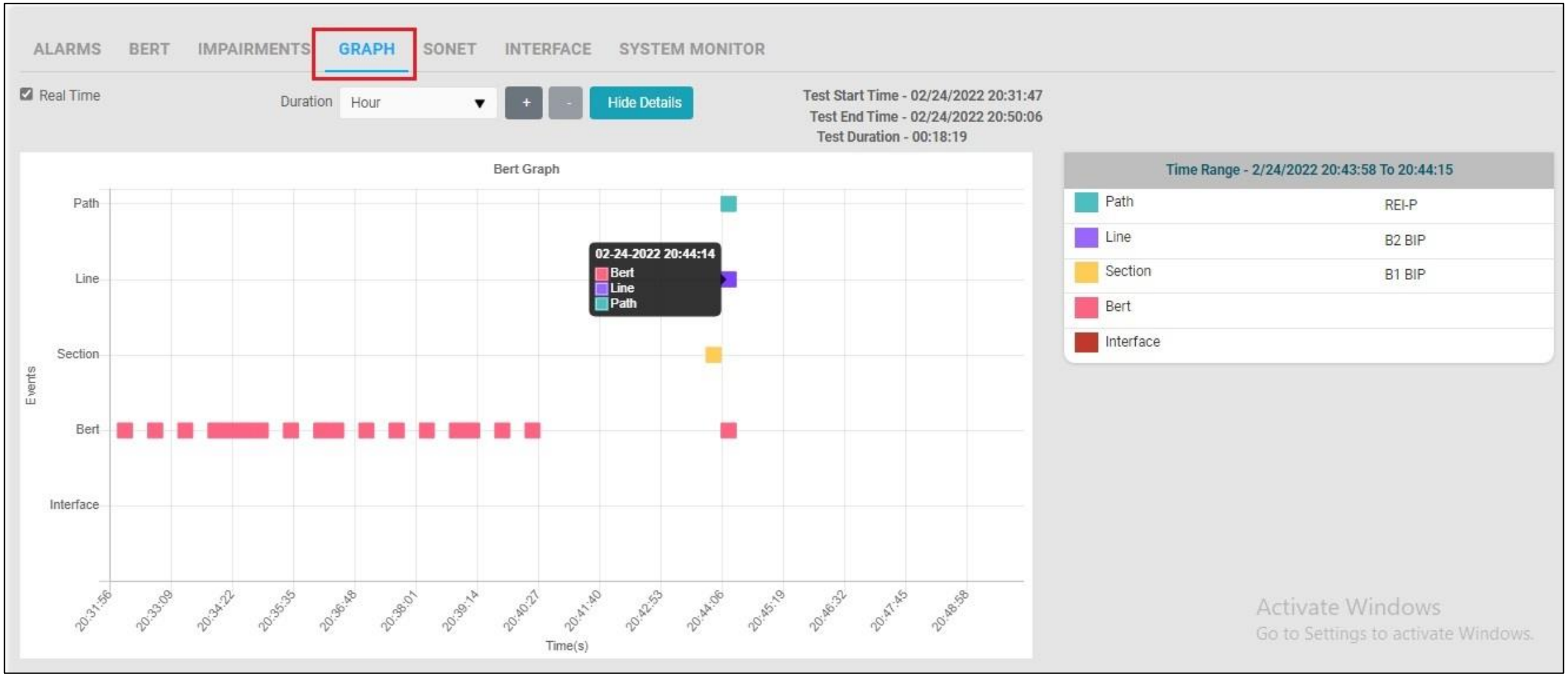


GL Communications

Impairments

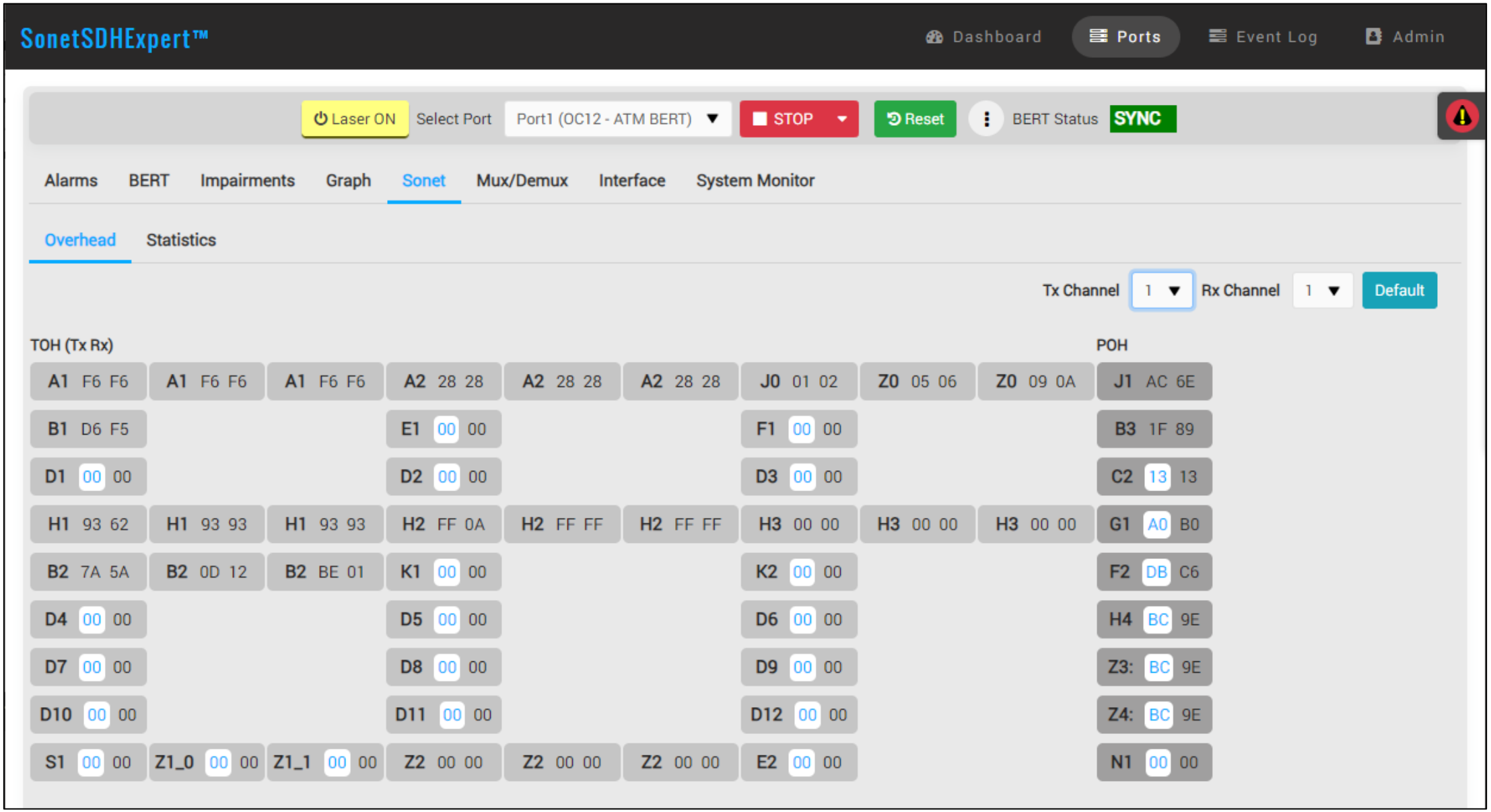


Graph

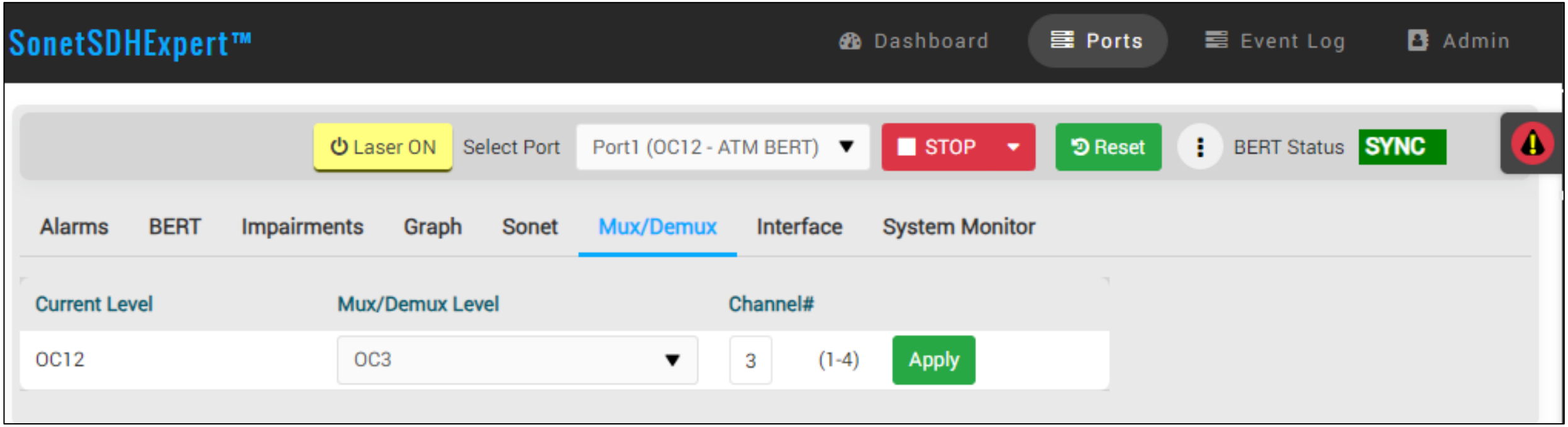


GL Communications

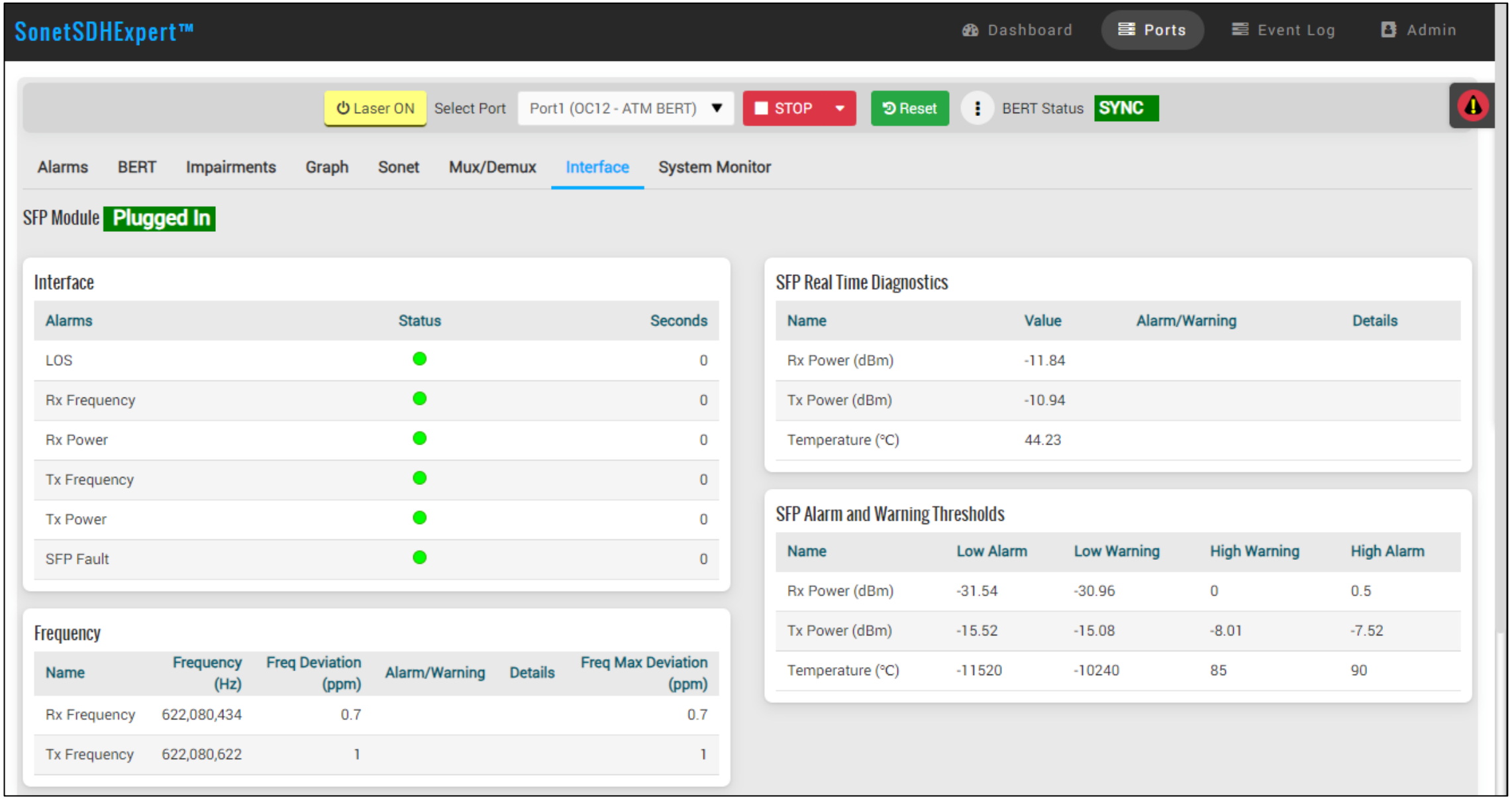
SONET Overhead - ATM



MUX/DEMUX

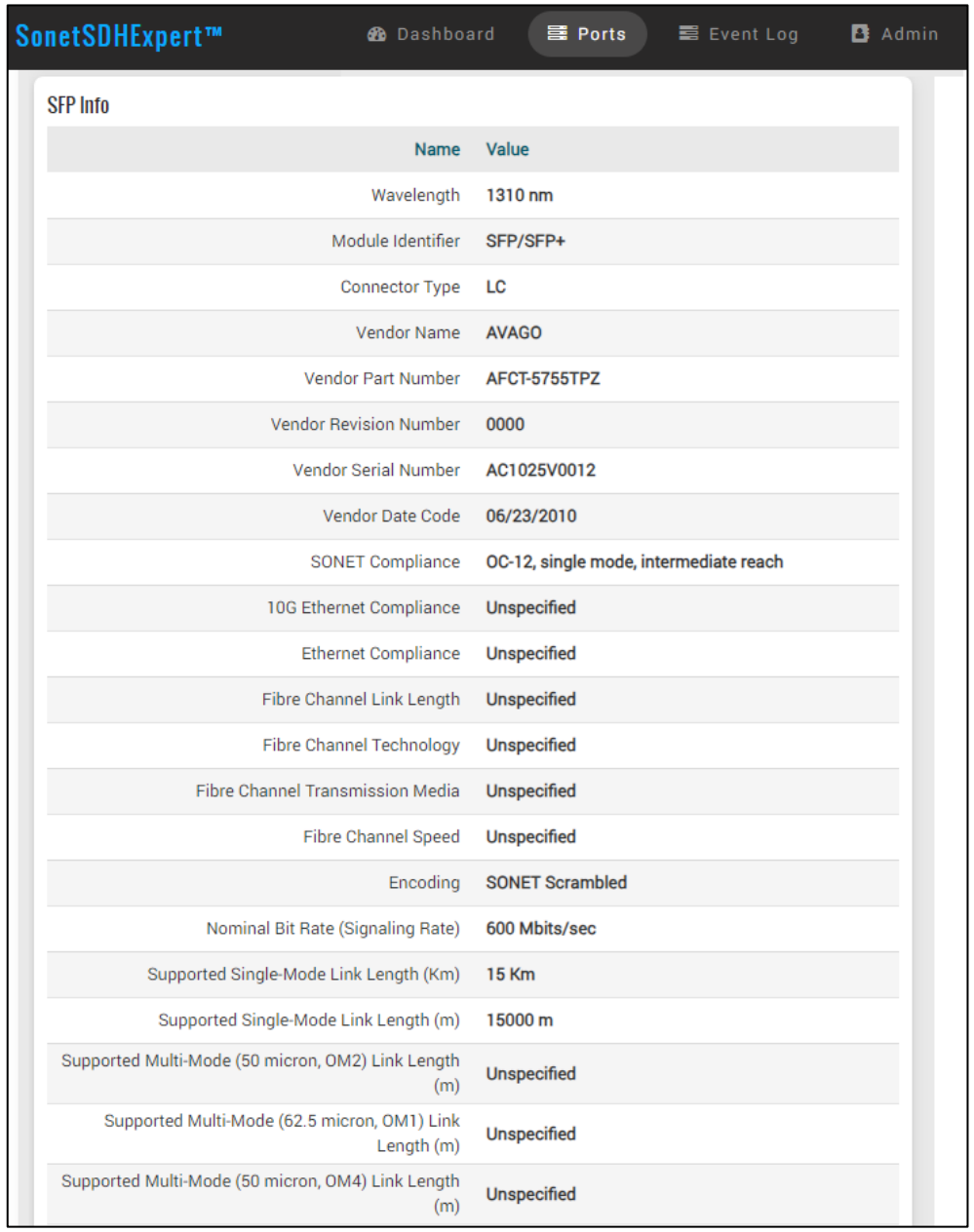

SonetSDHExpert™
Dashboard
Ports
Event Log
Admin
Laser ON
Select Port
Port1 (OC12 - ATM BERT)
STOP
Reset
BERT Status
SYNC
Alarms
BERT
Impairments
Graph
Sonet
Mux/Demux
Interface
System Monitor
Current Level
Mux/Demux Level
Channel#
OC12
OC3
3
(1-4)
Apply

SFP Interface



GL Communications

SFP Interface (Contd.)

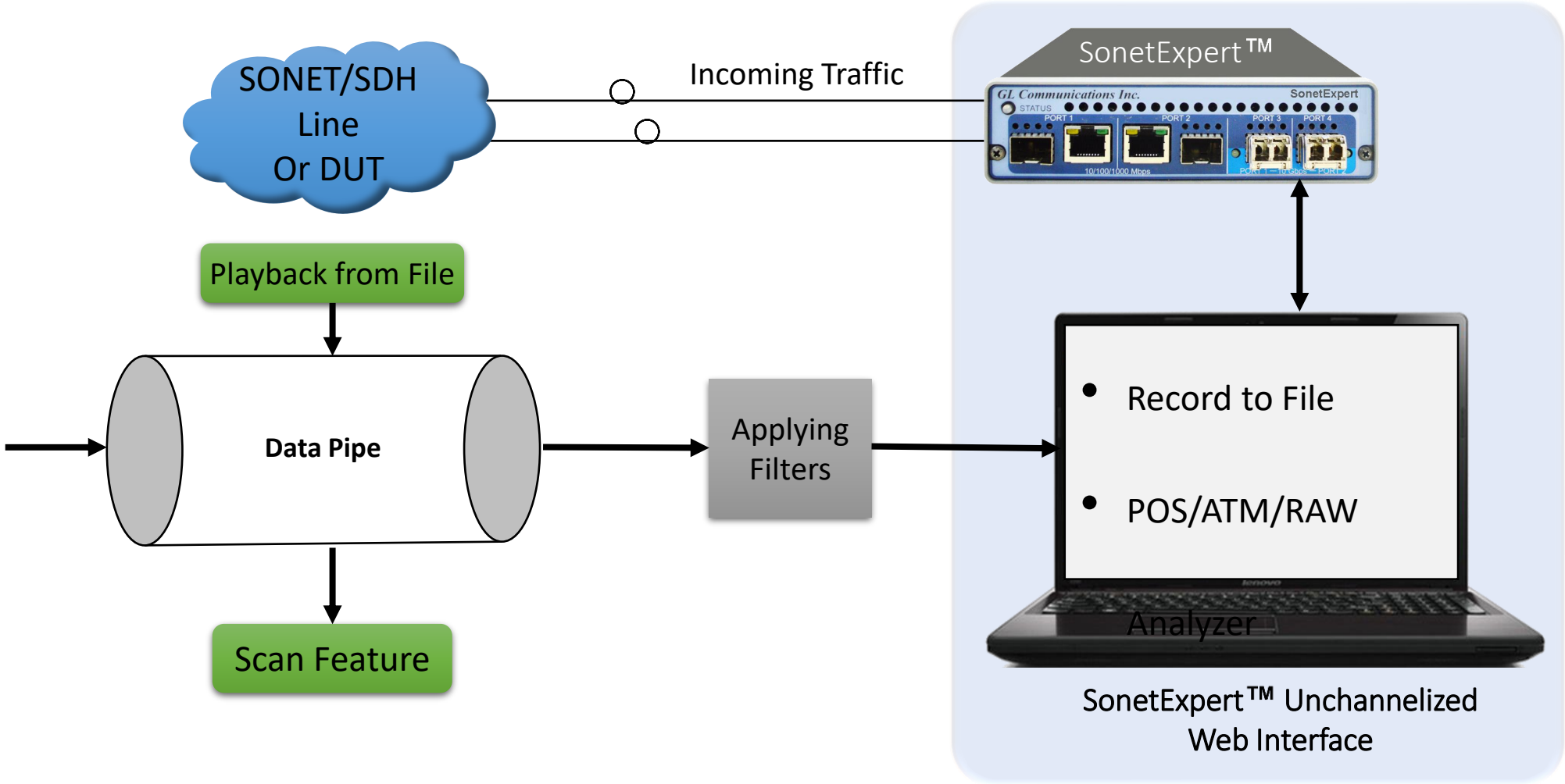


SFP Info

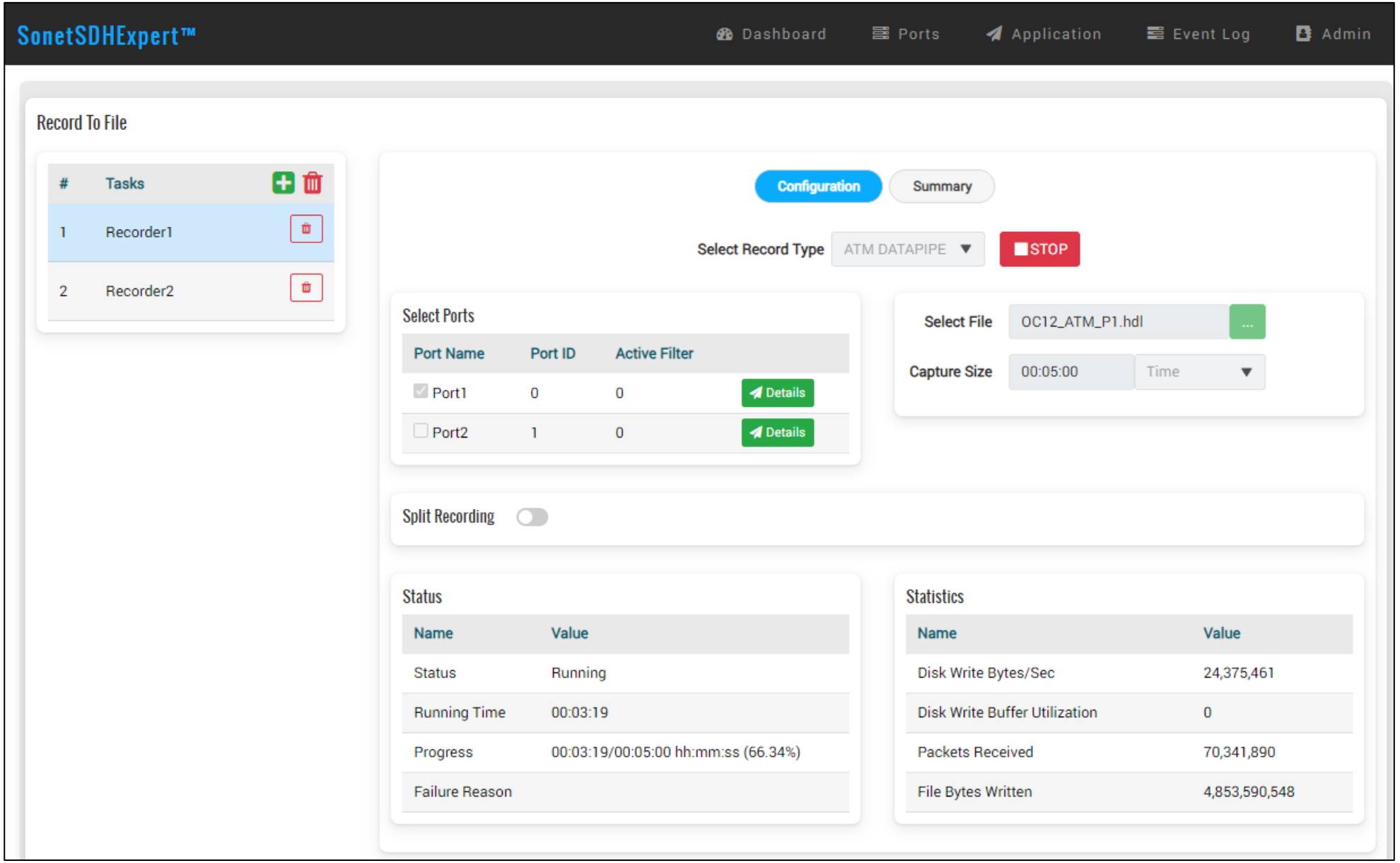
Name	Value
Wavelength	1310 nm
Module Identifier	SFP/SFP+
Connector Type	LC
Vendor Name	AVAGO
Vendor Part Number	AFCT-5755TPZ
Vendor Revision Number	0000
Vendor Serial Number	AC1025V0012
Vendor Date Code	06/23/2010
SONET Compliance	OC-12, single mode, intermediate reach
10G Ethernet Compliance	Unspecified
Ethernet Compliance	Unspecified
Fibre Channel Link Length	Unspecified
Fibre Channel Technology	Unspecified
Fibre Channel Transmission Media	Unspecified
Fibre Channel Speed	Unspecified
Encoding	SONET Scrambled
Nominal Bit Rate (Signaling Rate)	600 Mbits/sec
Supported Single-Mode Link Length (Km)	15 Km
Supported Single-Mode Link Length (m)	15000 m
Supported Multi-Mode (50 micron, OM2) Link Length (m)	Unspecified
Supported Multi-Mode (62.5 micron, OM1) Link Length (m)	Unspecified
Supported Multi-Mode (50 micron, OM4) Link Length (m)	Unspecified

GL Communications

Data Pipe Working Principle

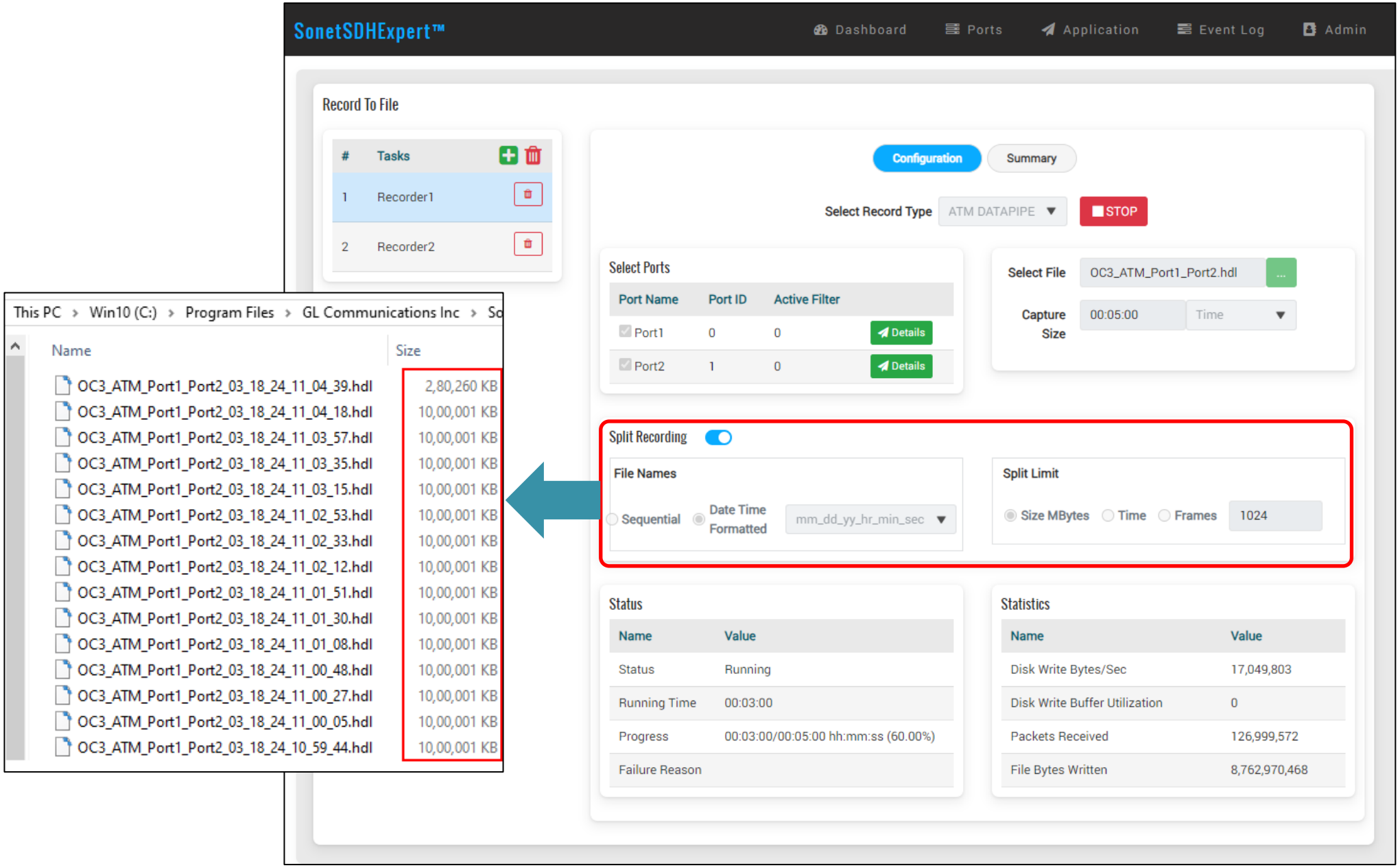


Record to File Application



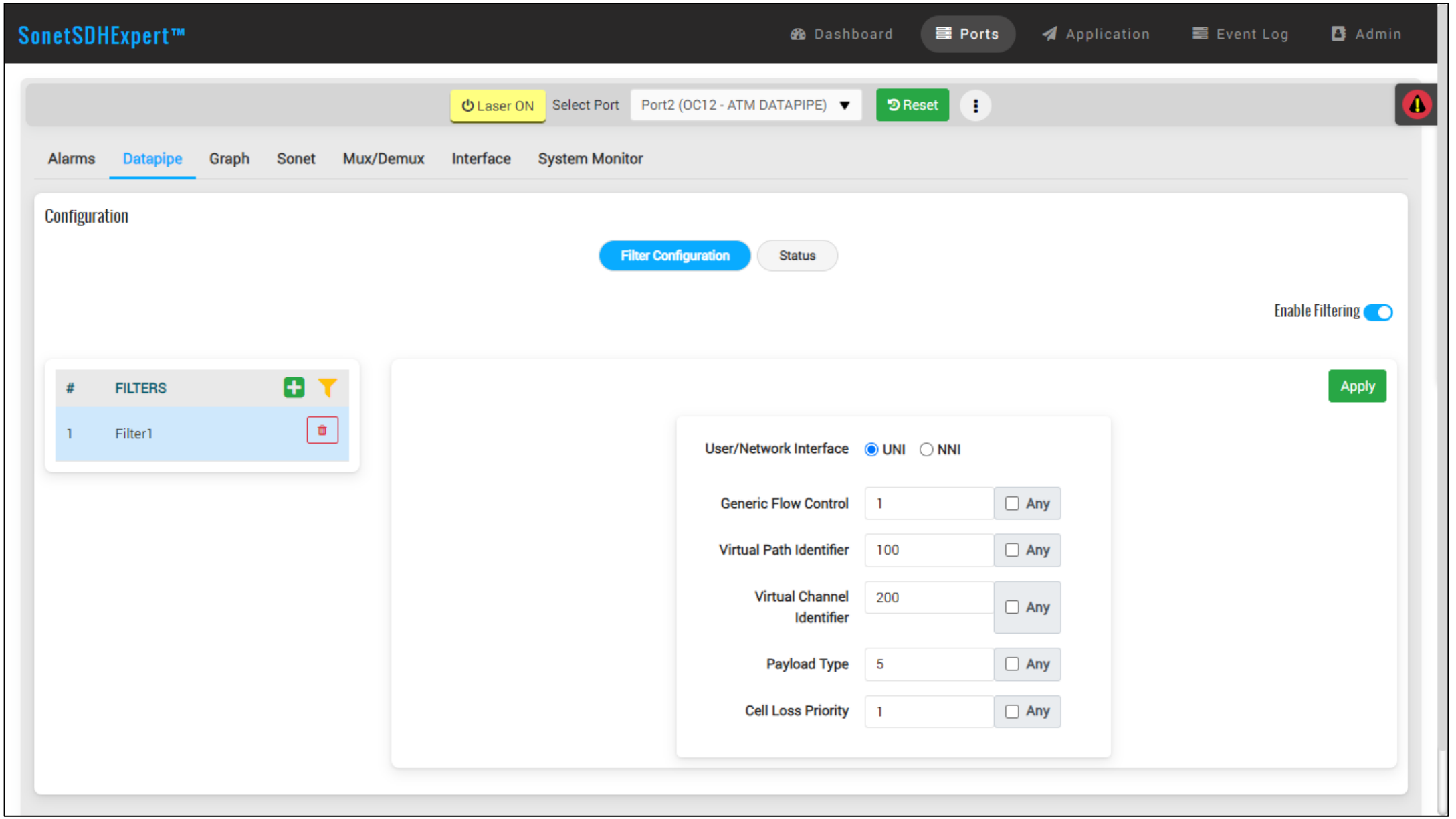
GL Communications

Split Recording



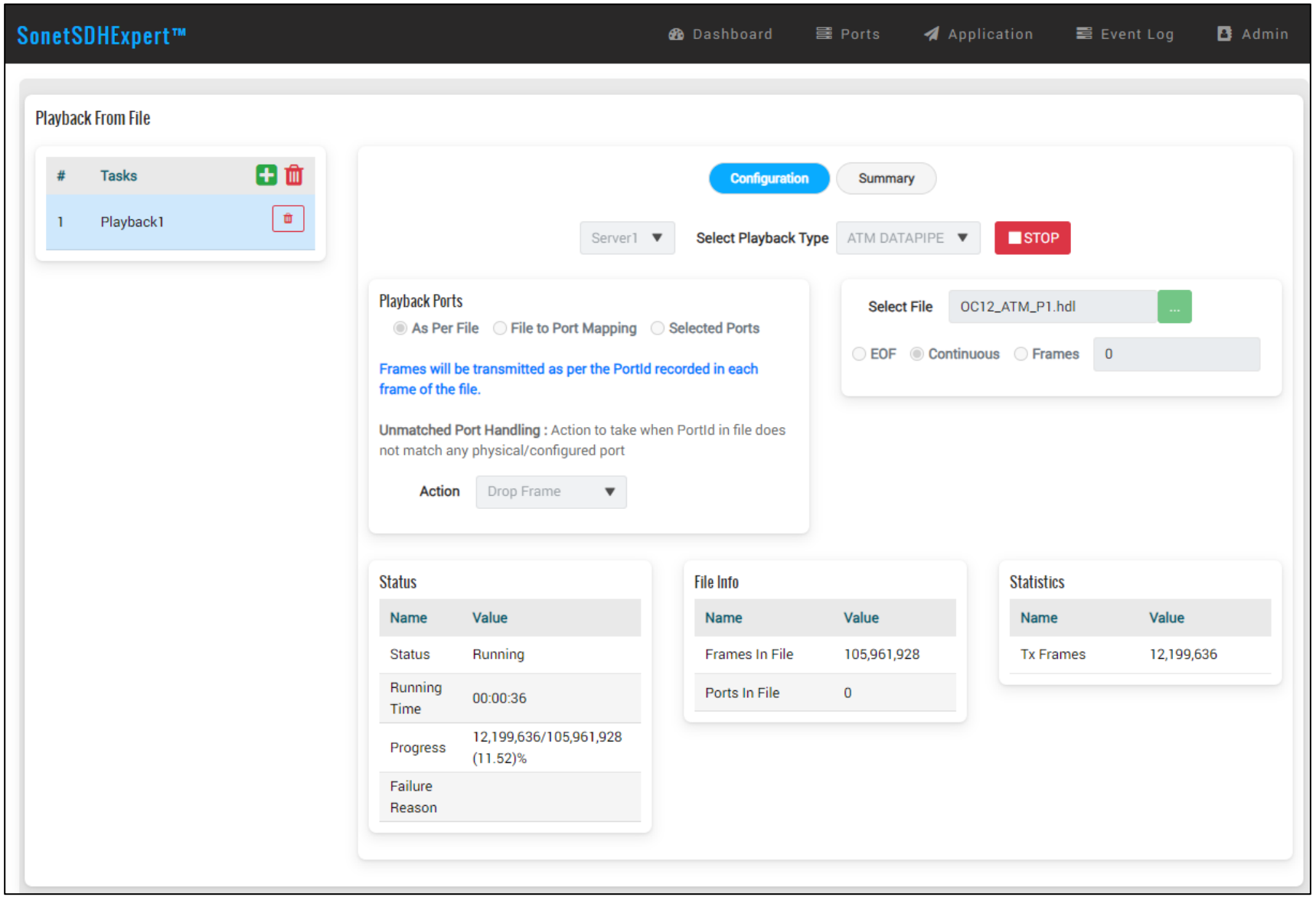
GL Communications

Hardware Filtering for ATM

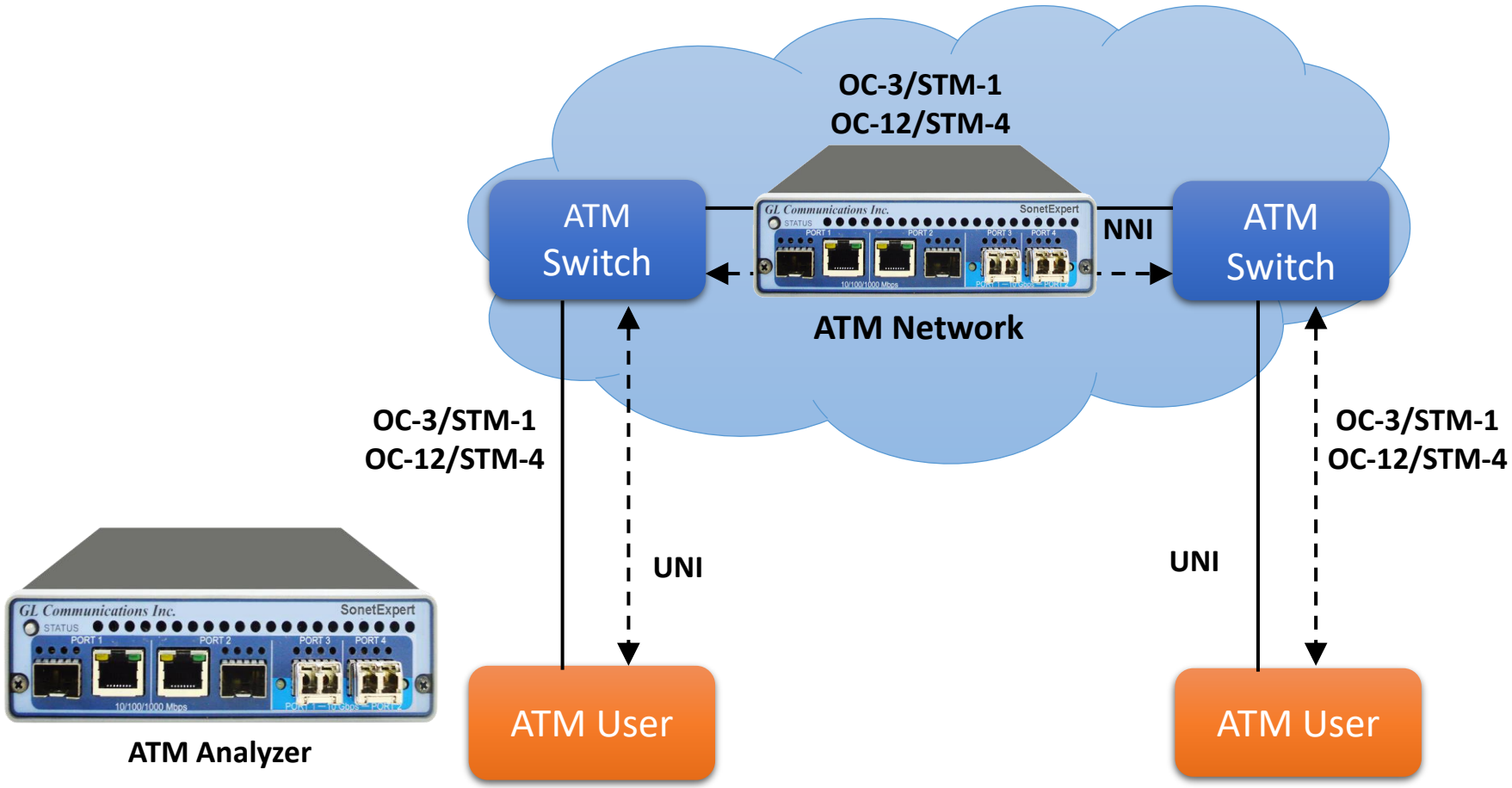


GL Communications

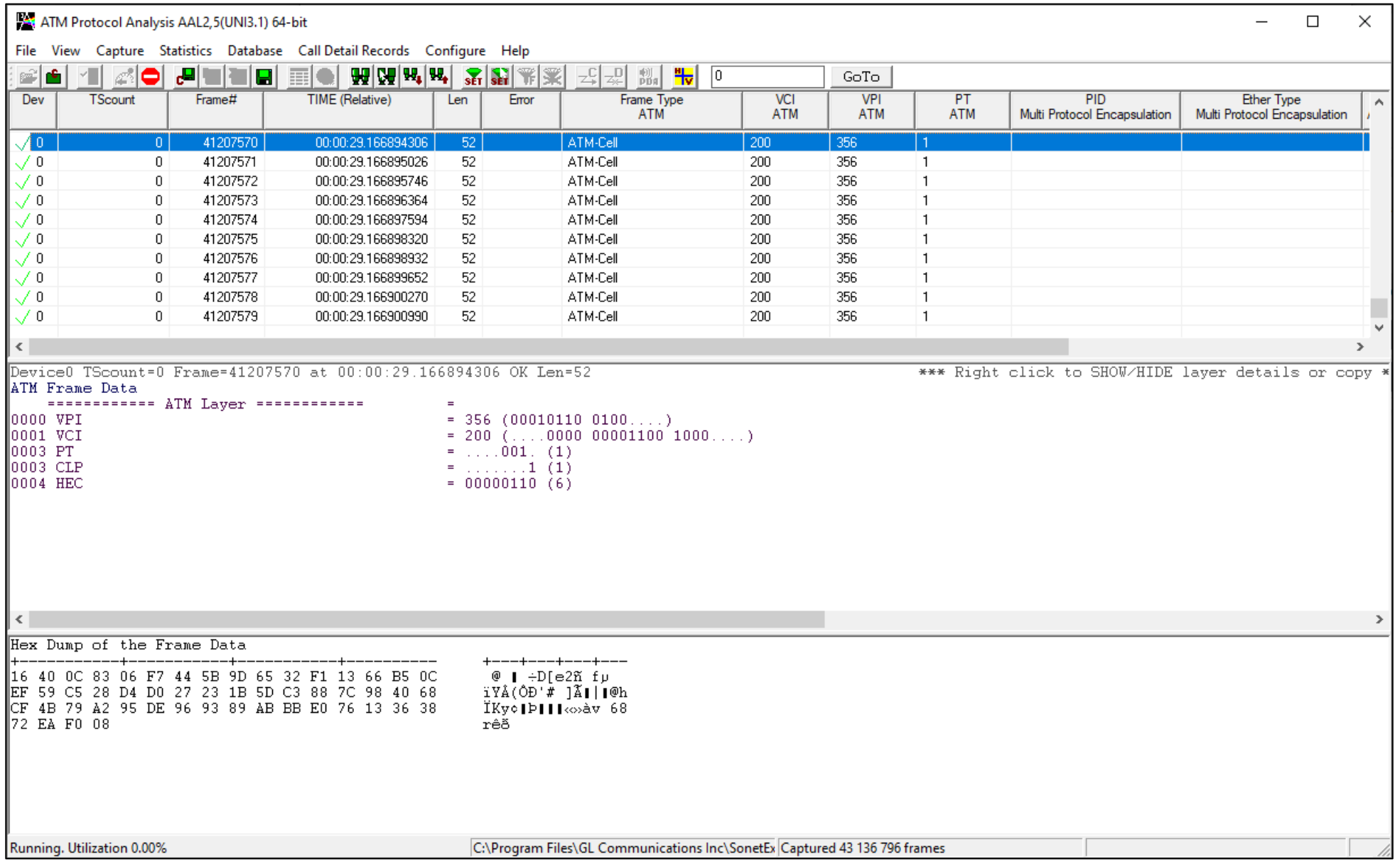
Playback from File Application



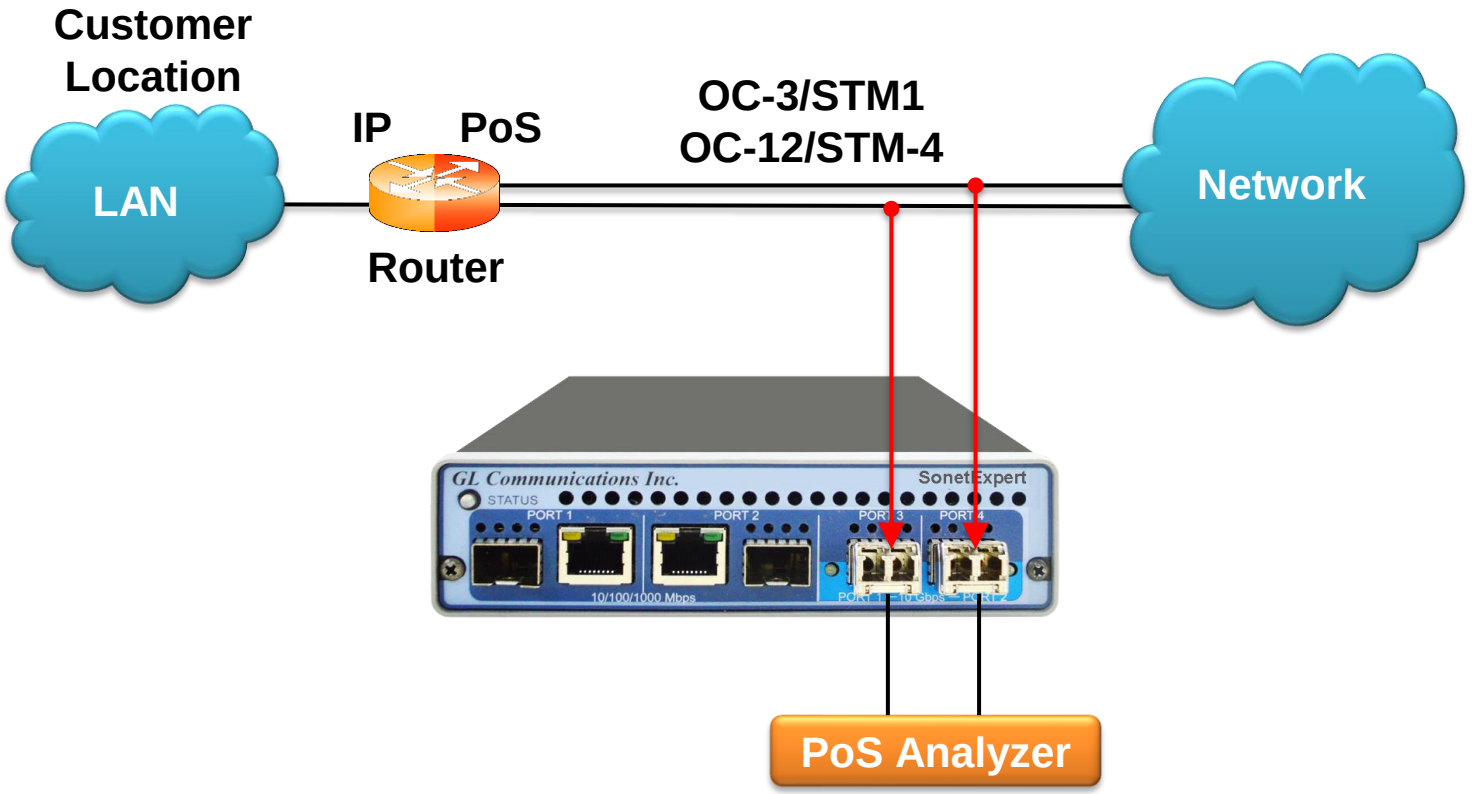
ATM Analyzer



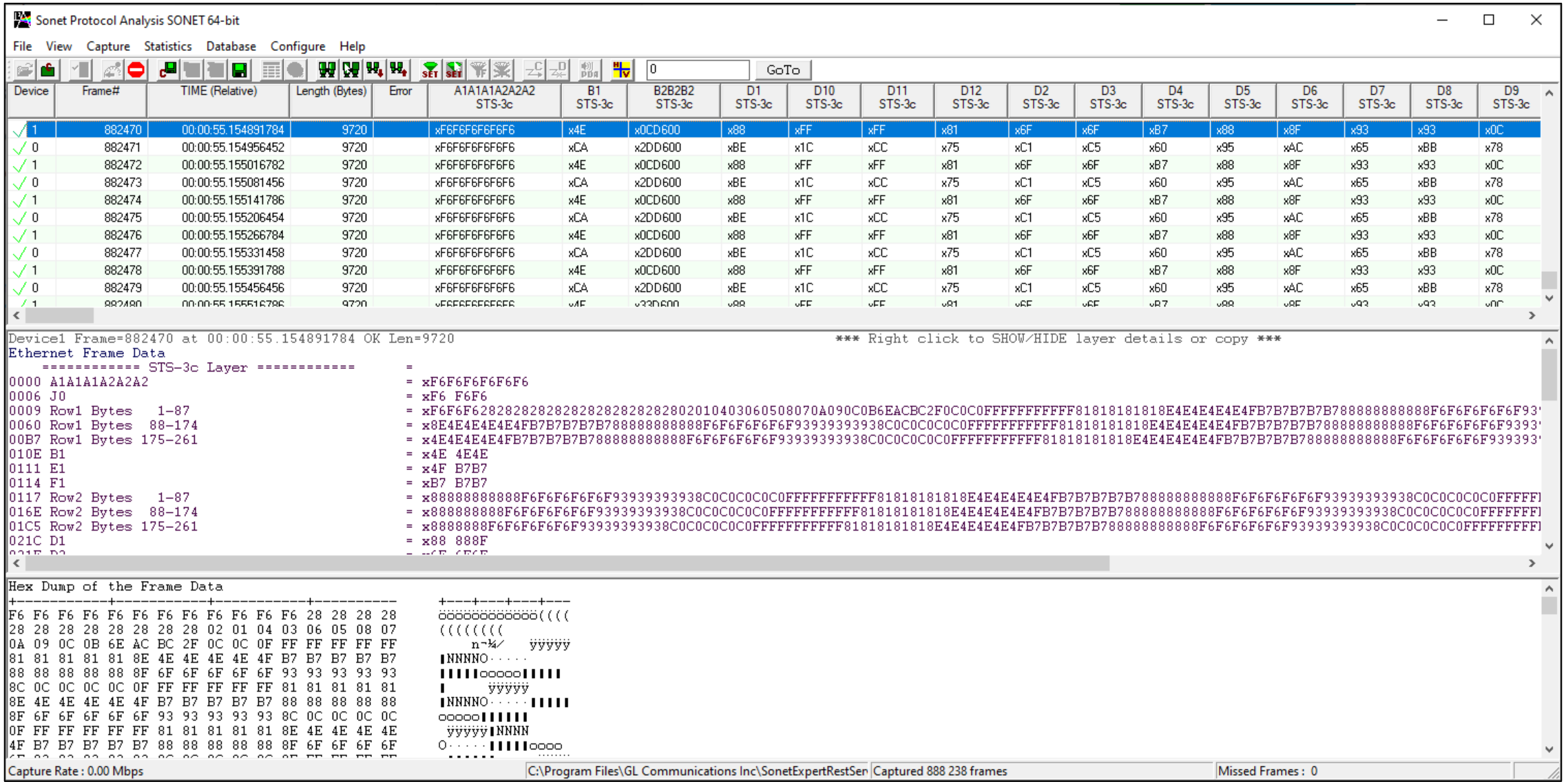
ATM Analyzer (Contd.)



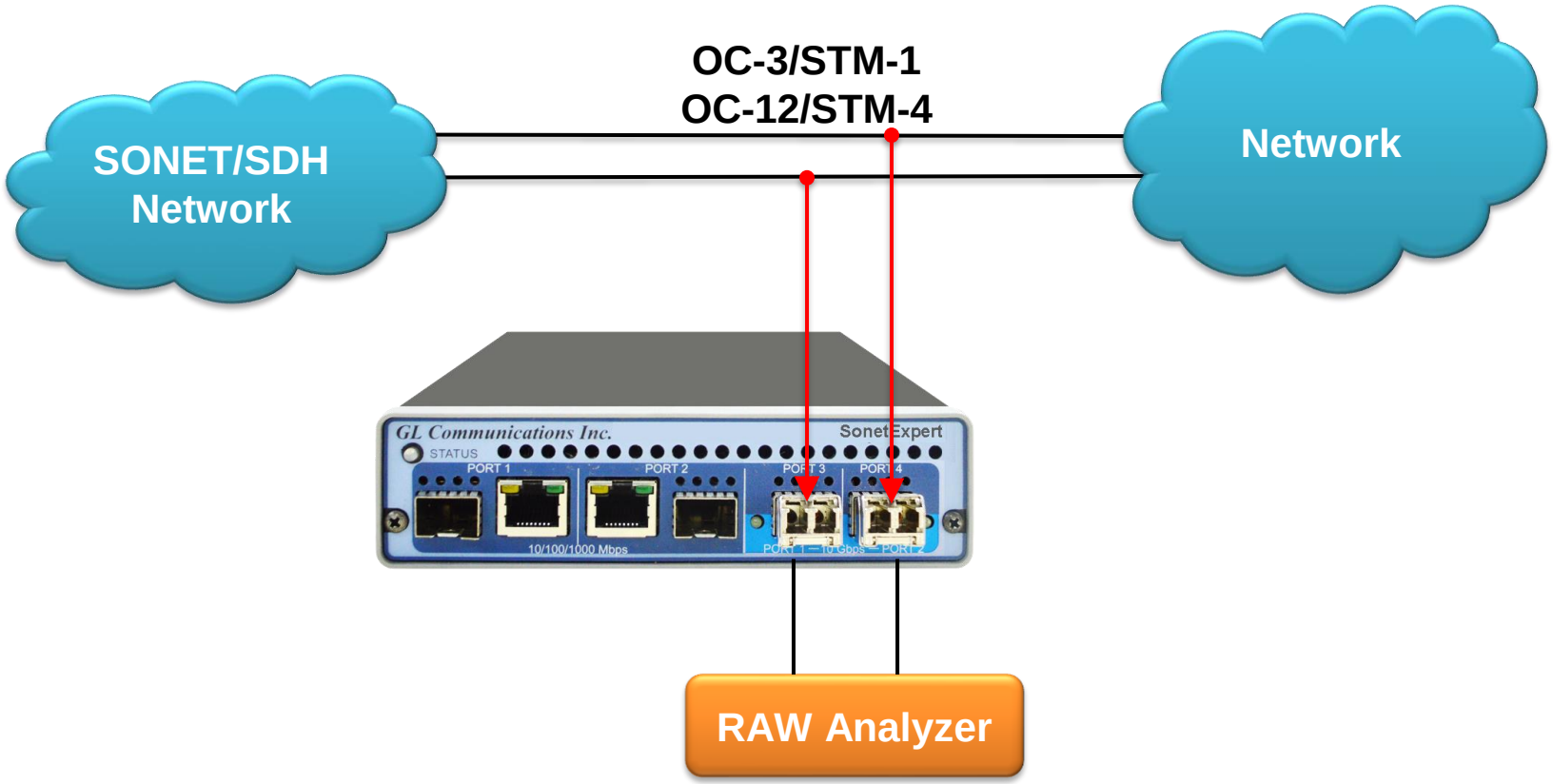
PoS Analyzer



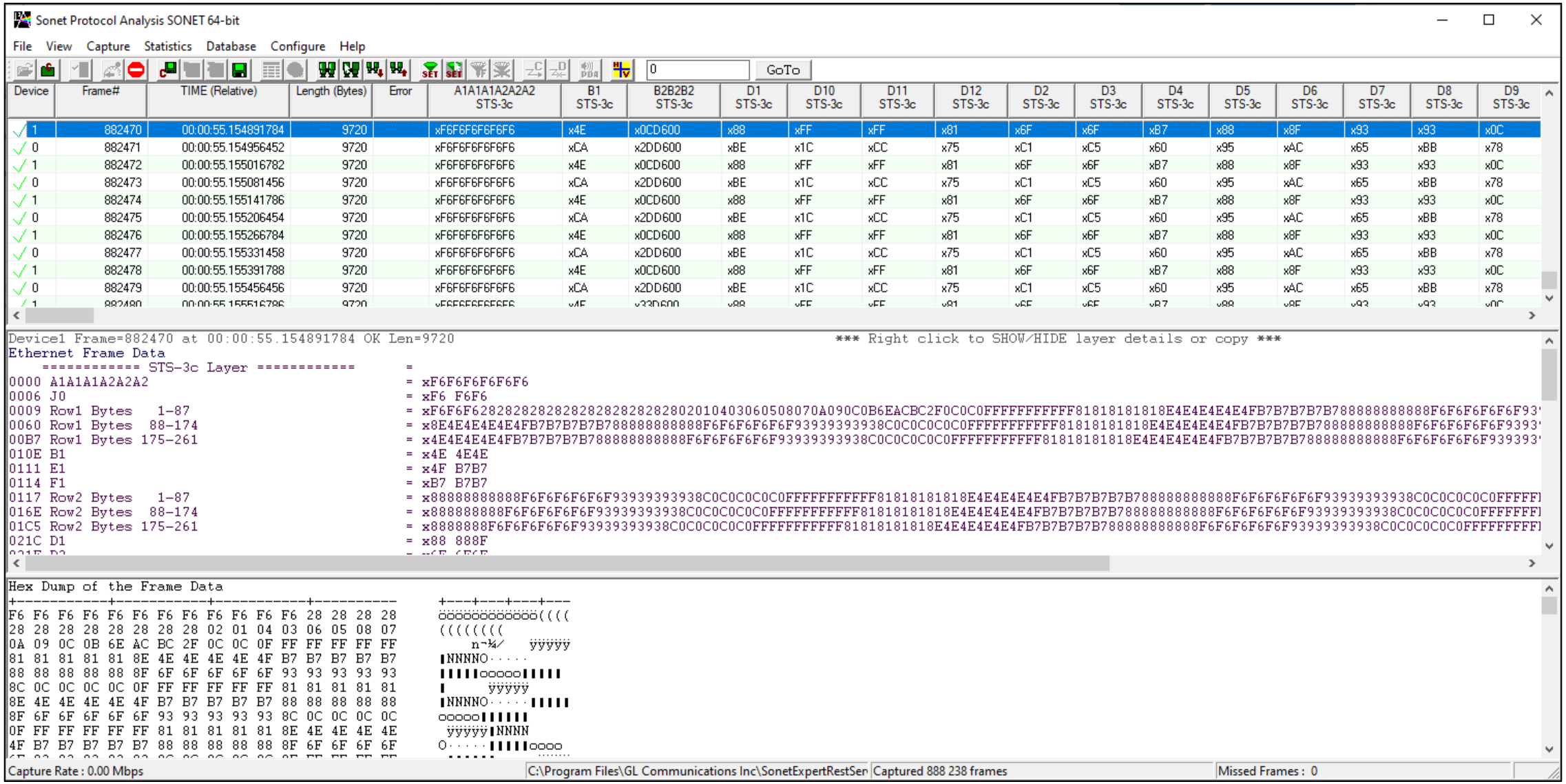
PoS Analyzer



RAW Analyzer

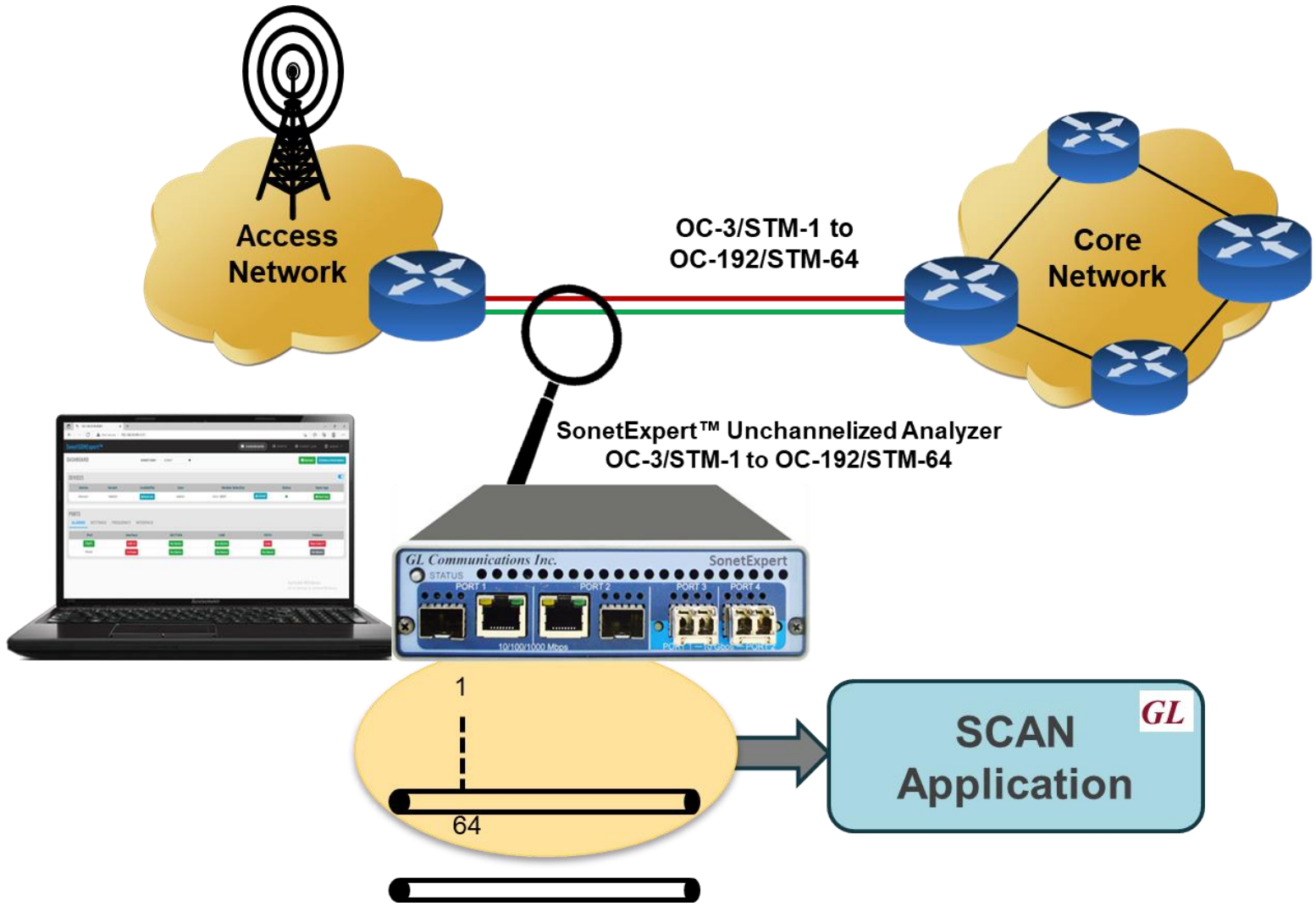


RAW Analyzer



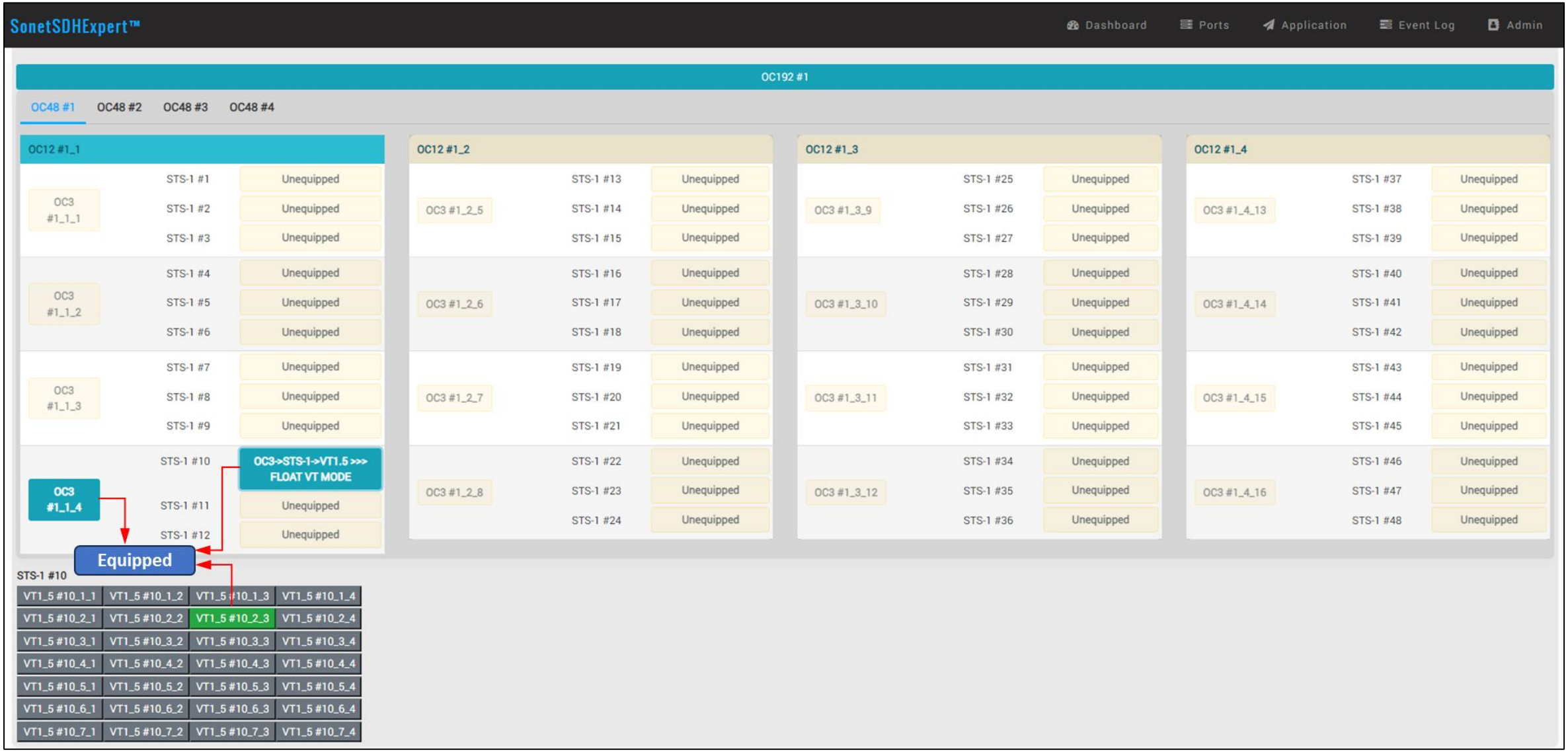
SCAN Application

- Scans the incoming traffic on SONET/SDH interfaces, identifies and displays the traffic structure
- Supported on OC-3/STM-1, OC-12/STM-4, OC-48/STM-16 and OC-192/STM-64 rates
- Traffic structure up to STS-3c is identified and displayed in the main display, with different colors clearly indicating equipped or unequipped channels
- Provides complete overview of the incoming SONET/SDH traffic in an easy and intuitive graphical display and helps technicians to quickly identify the structure of unknown SONET/SDH traffic
- User selectable **SONET** or **SDH** terminology supported on both the ports independently



SCAN Application – SONET

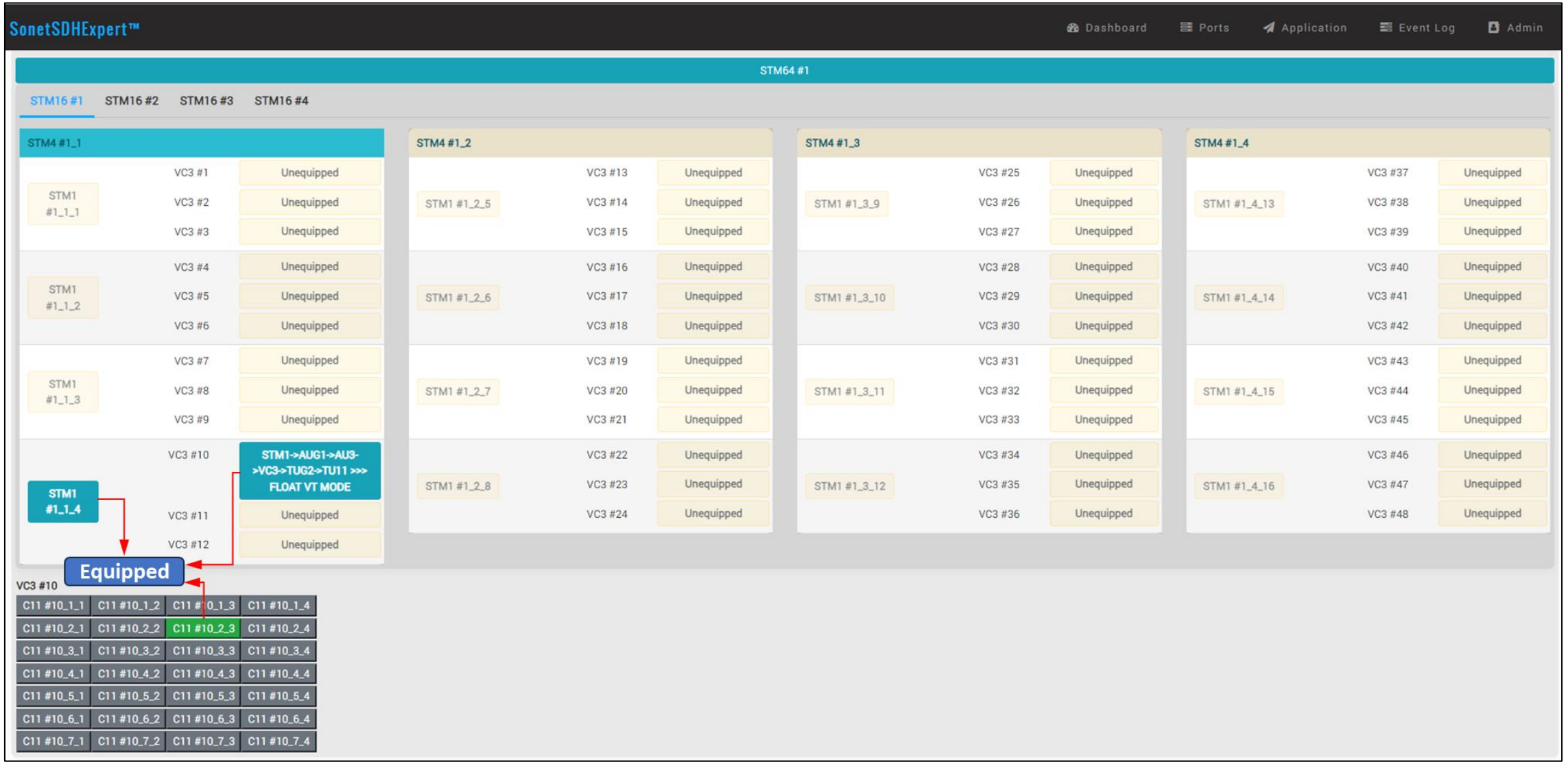
OC-192 with Substructure



GL Communications

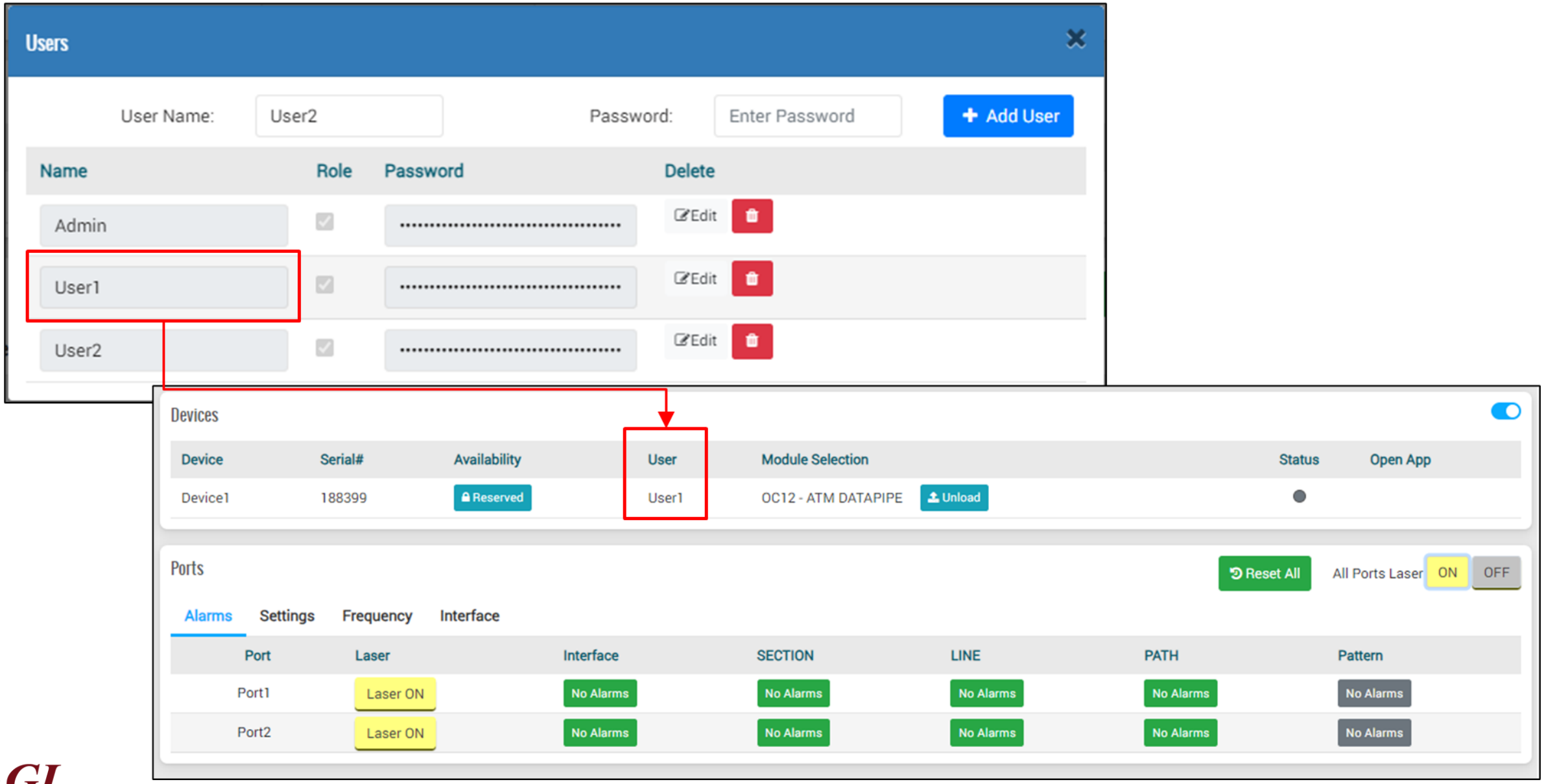
SCAN Application - SDH

STM-64 with Substructure



GL Communications

Multiuser Support



GL Communications

Thank you