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# SonetExpert™ Channelized Analyzer

(OC-3/STM-1 and OC-12/STM-4)

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# Introduction

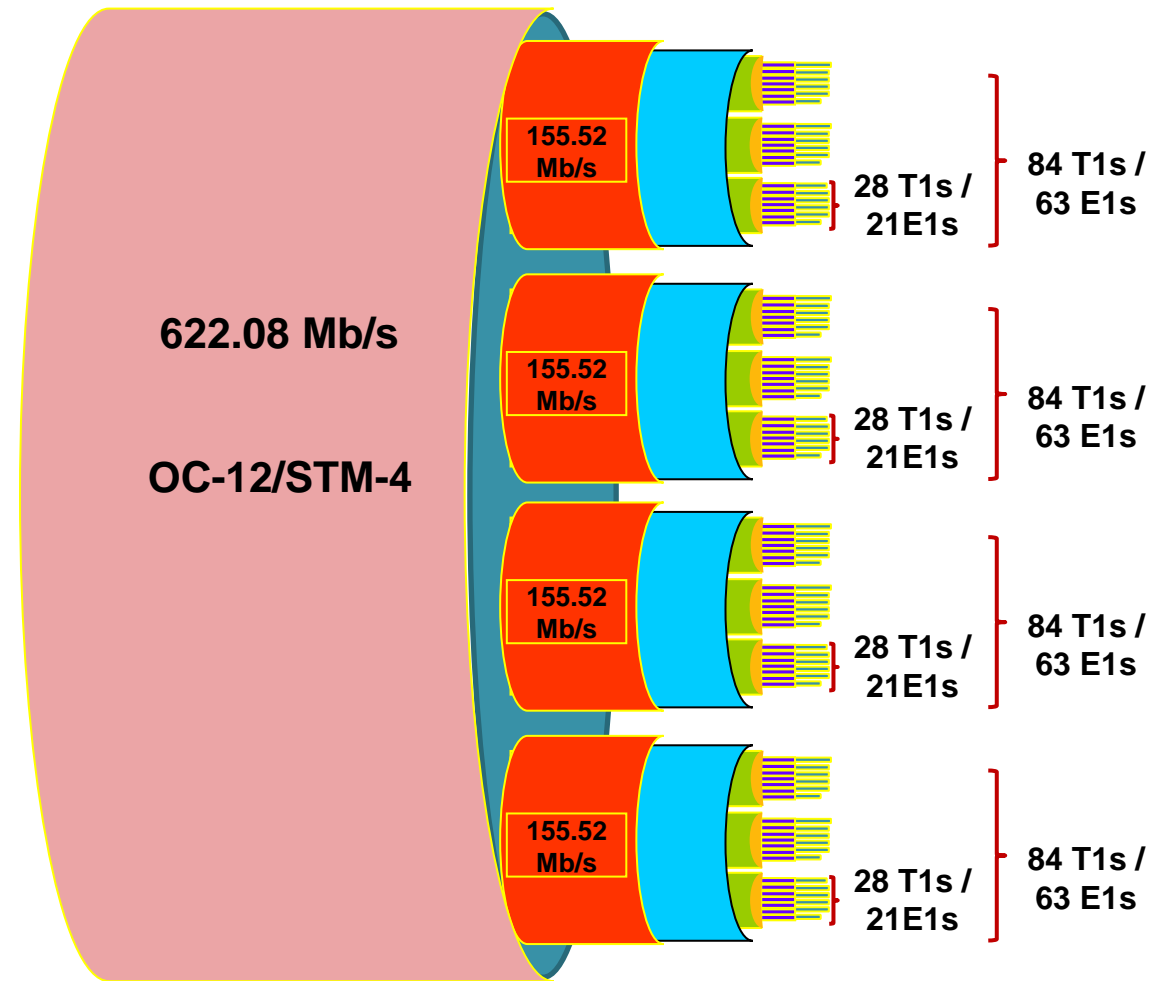
- Sonet = Synchronous optical networking. Used in North America
- SDH = Synchronous digital hierarchy. Used in the rest of the world
- Sonet and SDH are optical transmission protocols for high-speed data, voice and video traffic
- Data rates
  - Sonet: Optical Carrier (OC) - N
  - SDH: Synchronous Transport 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
  - Unchannelized = Packet over Sonet (PoS), Asynchronous Transfer Mode (ATM)

# Sonet/SDH Line Rates

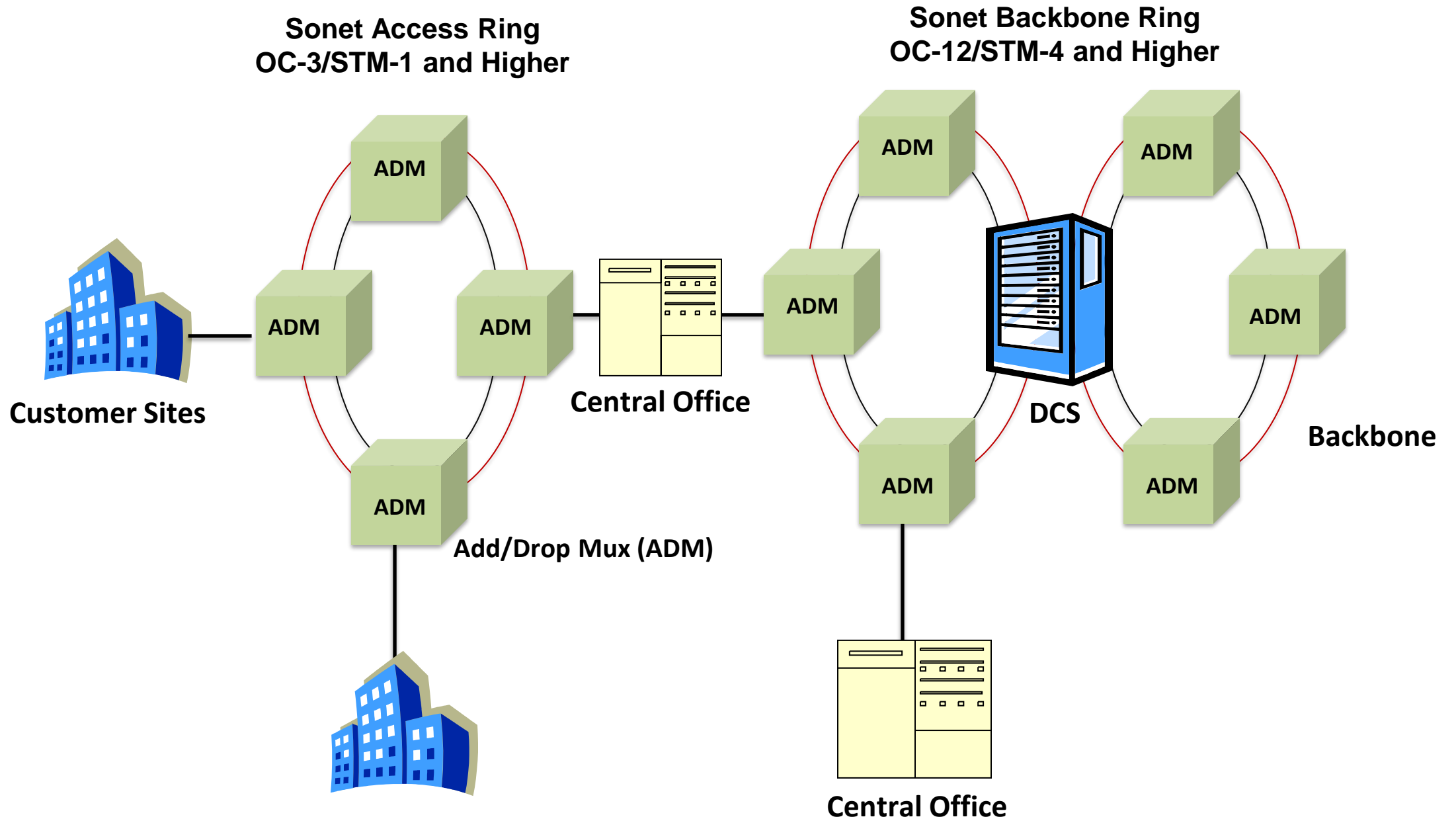
Electrical	Optical (Sonet)	Line Rates	SDH Equivalent
STS-1	OC-1	51.84 Mbps	—
STS-3	OC-3	155.52 Mbps	STM-1
STS-9	OC-9	466.56 Mbps	—
STS-12	OC-12	622.08 Mbps	STM-4
STS-18	OC-18	933.12 Mbps	—
STS-24	OC-24	1.2 Gbps	—
STS-36	OC-36	1.9 Gbps	—
STS-48	OC-48	2.5 Gbps	STM-16
STS-96	OC-96	5 Gbps	—
STS-192	OC-192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

# Channelized OC-3/STM-1 and OC-12/STM-4

- DS0 = Digital Signal 0 (64 Kbps)
  - Carries digital traffic (including voice)
- T1 = 24 DS0
- E1 = 32 DS0
- OC-3/STM-1 = 84 T1 or 63 E1
- OC-12/STM-4 = 4 STM-1/OC-3
  - OC-12/STM-4 = 336 T1
  - OC-12/STM-4 = 252 E1
- OC-12/STM-4 can support ~ 8000 data streams (voice calls)



# Sonet Network Elements

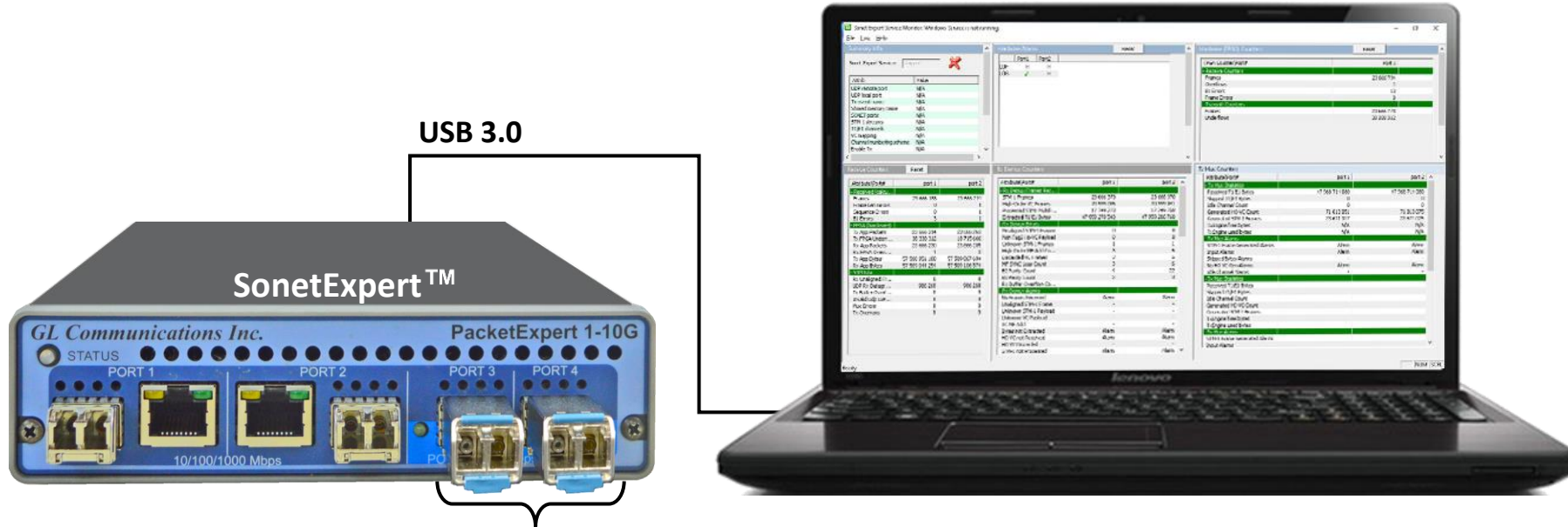


# Sonet/SDH Testing Scenarios

- Monitor T1s, E1s, and DS0s directly without requiring physical access
  - Accessing individual T1s or E1s on a Sonet/SDH link
  - Readily identify traffic types within the complex Sonet/SDH structure
  - Capturing and analyzing voice calls for call quality or surveillance
- Load testing Sonet/SDH network by generating the maximum number of voice calls/data streams
- Real time alarm detection and management: Send SNMP traps at the individual T1 E1 level for network management

# SonetExpert™ Sonet/SDH Channelized Testing Solution

# SonetExpert™

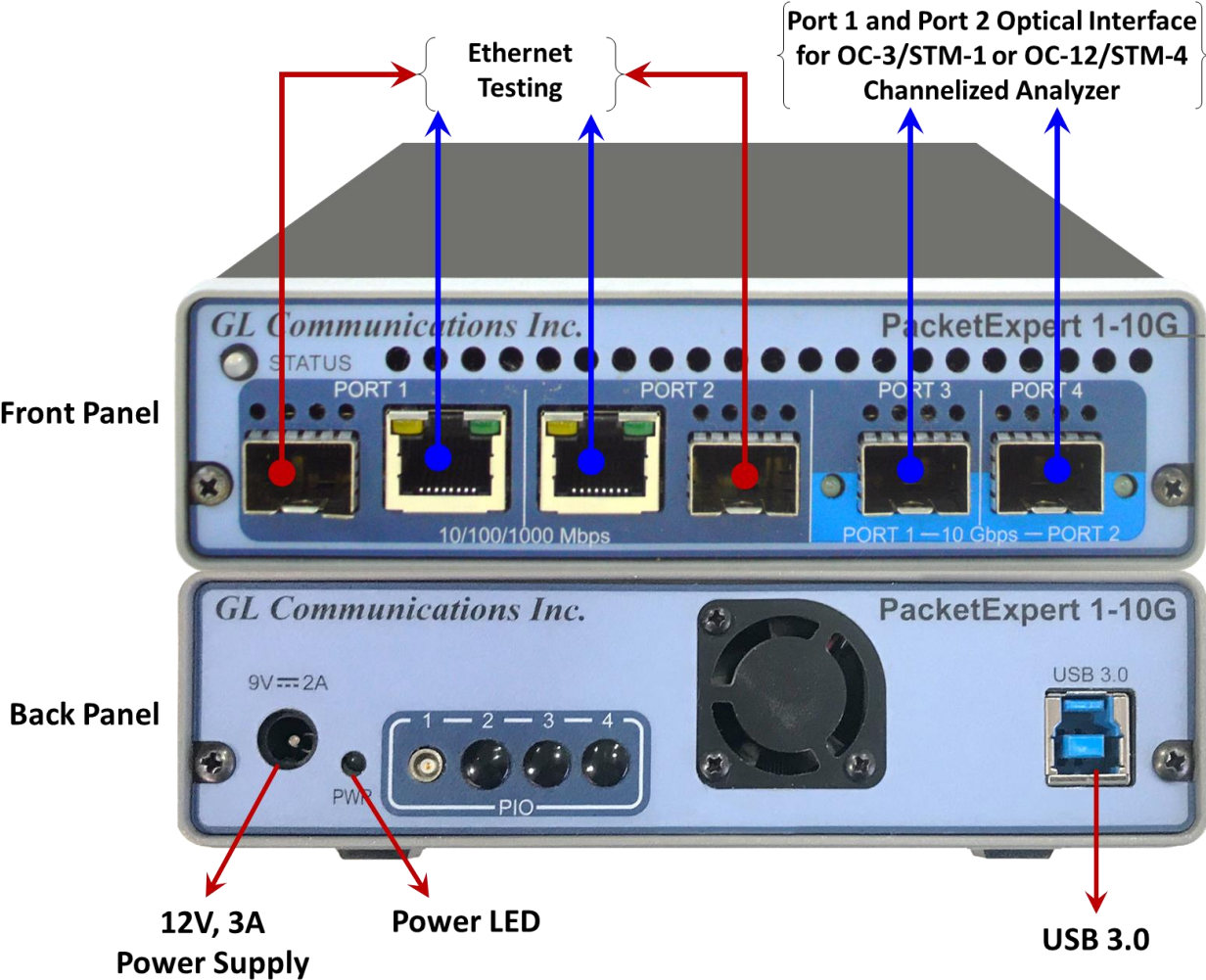


**Channelized Ports (Port 1 and Port 2)**  
**OC-3/STM-1 or OC-12/STM-4**

SonetExpert™ is configured from a Windows® 10 PC via USB 3.0 port



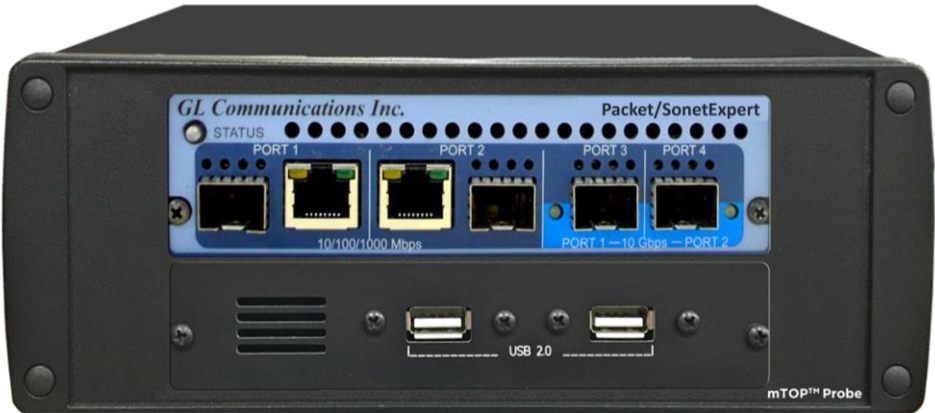
# SonetExpert™ Portable Hardware Unit



Interfaces	<ul style="list-style-type: none"><li>• 2 x Channelized Ports (OC-3/STM-1 or OC-12/STM-4)</li><li>• Single Mode or Multi Mode Fiber SFP support with LC connector</li><li>• USB 3.0 Port</li><li>• External Clock: Input Port 1, Port 2 and Output Port 1, Port 2</li></ul>
T1 E1	<ul style="list-style-type: none"><li>• Sync Loss, HDB3 Violation, Carrier Loss, Frame Error, Remote, Distant MF, AIS, BPV Errors, CRC Errors, Frame Errors, Transmit Under Run, Receive Over Run</li></ul>
Dimensions	<ul style="list-style-type: none"><li>• Length: 8.45 in. (214.63 mm)</li><li>• Width: 5.55 in. (140.97 mm)</li><li>• Height: 1.60 in (40.64 mm)</li></ul>
External Power Supply	<ul style="list-style-type: none"><li>• +12 Volts (Medical Grade), 3 Amps</li></ul>

# SonetExpert™ mTOP™ Probe unit

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



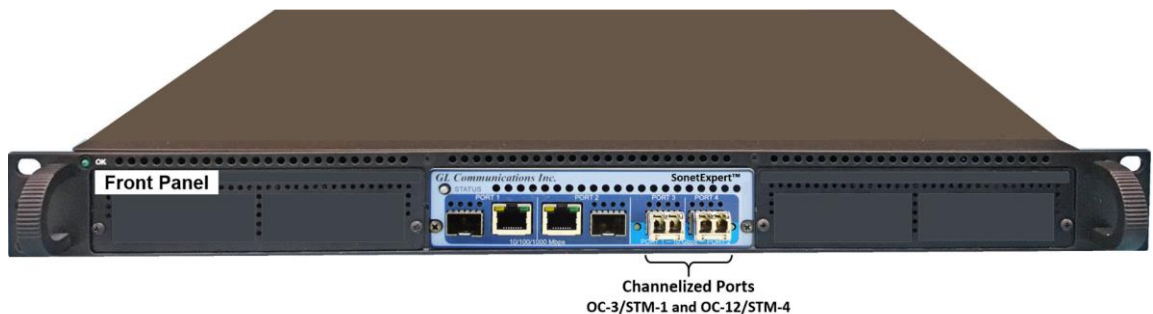
**SonetExpert™ mTOP™ Probe Solution  
(Front Panel)**



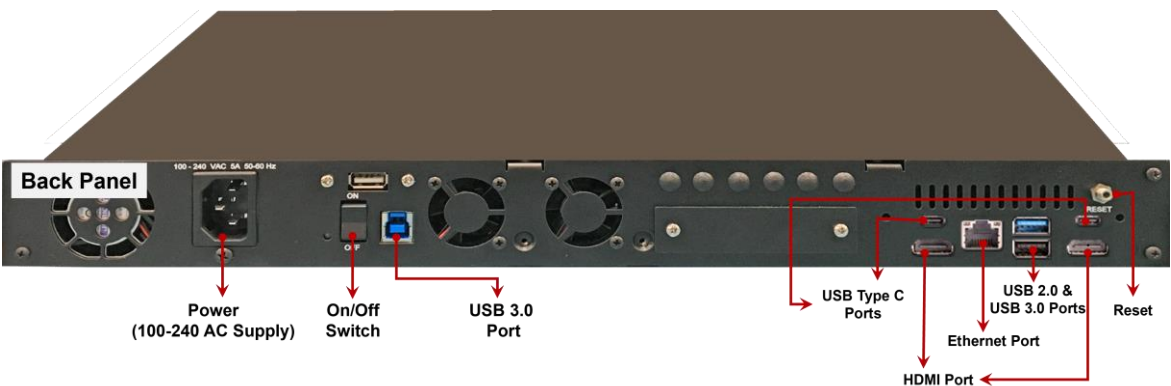
**SonetExpert™ mTOP™ Probe Solution  
(Back Panel)**

Physical Specifications	<ul style="list-style-type: none"><li>• Height: 3.0 Inches (76.2 mm)</li><li>• Length: 10.4 Inches (264.16 mm)</li><li>• Width: 8.4 Inches (213.36 mm)</li><li>• Optional 4-Port SMA Jack Trigger Board (TTL Input/Output)</li><li>• External USB based Wi-Fi adaptor</li></ul>
SonetExpert™ interfaces (1 unit)	<ul style="list-style-type: none"><li>• 4x 1G Base-X Optical OR 10/100/1000 Base-T Electrical</li><li>• 2x 10G Base-SR, -LR -ER Optical option</li><li>• 2 x 100 Mbps Base-FX optical interface</li><li>• Single Mode or Multi Mode Fiber SFP support with LC connector</li></ul>
External Power Supply	<ul style="list-style-type: none"><li>• +12 Volts (Medical Grade), 3 Amps</li></ul>
SBC Specifications	<ul style="list-style-type: none"><li>• AMD Ryzen 9 Series Processor or Intel Core i9 Equivalent</li><li>• Windows® 10 and above 64-bit Pro Operating System</li><li>• USB 2.0 or 3.0 Ports, ATX Power Supply</li><li>• 256 GB Hard drive, 8G Memory (Min)</li><li>• Two HDMI ports (Optional VGA to HDMI interface)</li></ul>

# SonetExpert™ mTOP™ 1U Rack Solution



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



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

Physical Specifications	<ul style="list-style-type: none"><li>• Height: 1U Rack</li><li>• Length: 16 Inches</li><li>• Width: 19 Inches</li><li>• mTOP™ System (embedded SBC, 1x SonetExpert™)</li></ul>
SonetExpert™ interfaces (1 unit)	<ul style="list-style-type: none"><li>• Two channelized Ports (OC-3/STM-1 or OC-12/STM-4)</li><li>• Single Mode or Multi Mode Fiber SFP support with LC connector</li></ul>
SBC Specifications	<ul style="list-style-type: none"><li>• AMD Ryzen 9 Series Processor or Intel Core i9 Equivalent</li><li>• Windows® 10 and above 64-bit Pro Operating System</li><li>• USB 2.0 or 3.0 Ports, ATX Power Supply</li><li>• USB Type C ports, Ethernet 2.5GigE port</li><li>• 256GB Hard drive, 8G Memory (Min)</li></ul>

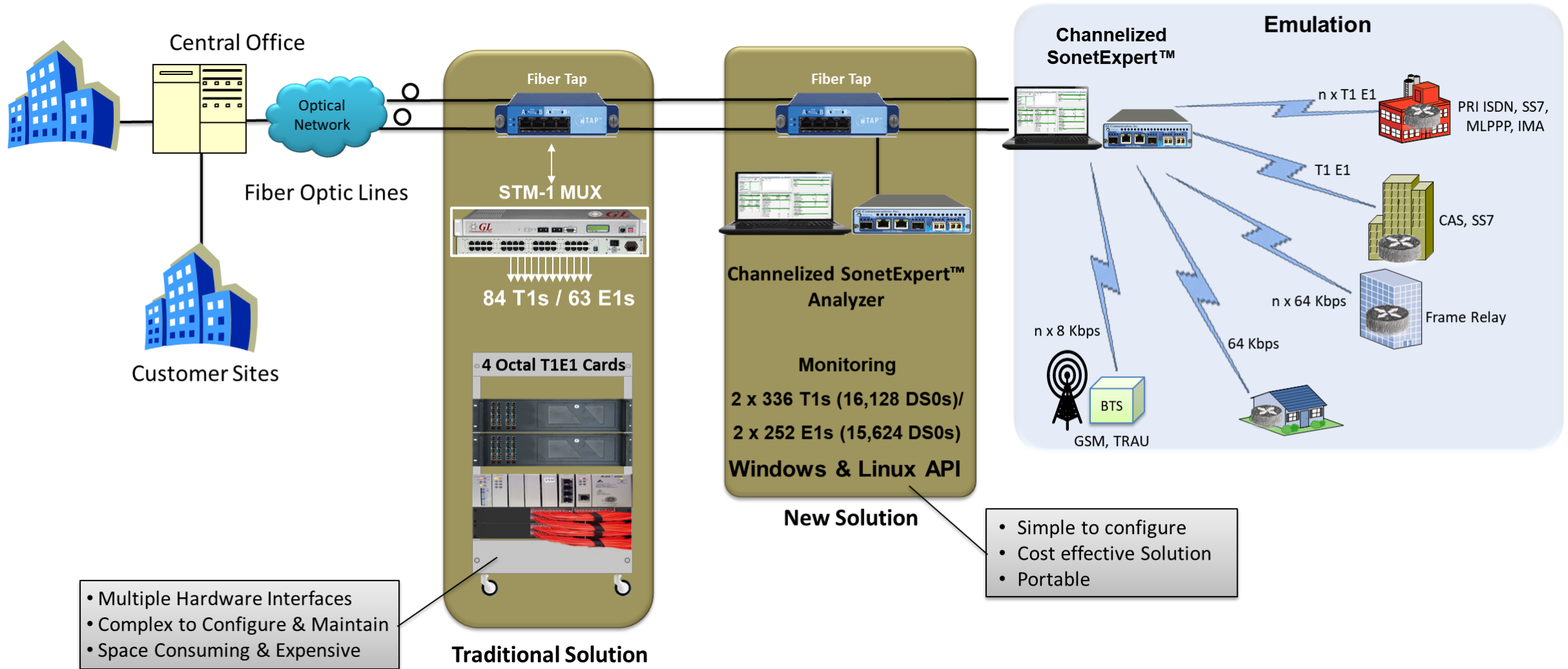
# SonetExpert™ Features

- 2 Channelized Ports:
  - OC-3/STM-1 or OC-12/STM-4 interfaces
  - Simulate and monitor in both directions
- Configure the number of T1 E1 channels to be Multiplexed or Demultiplexed
- Analyze/emulate voice, data, fax, protocols, analog and digital signals, including echo and voice quality
- Comprehensive protocol analysis and emulation - HDLC, SS7, ISDN, CAS, PPP, Frame Relay, ATM and more
- Capture, transmit and process at wirespeed
- Broadcasts the selected T1 E1 channel data on all the 252 E1's or 336 T1's
- Direct access to any or all T1s and E1s
  - $2 \times 336 \text{ T1's} \times 24 = 16,128 \text{ DS0s}$
  - $2 \times 252 \text{ E1's} \times 31 = 15,624 \text{ DS0s}$

# SonetExpert™ Features (Contd.)

- Pluggable SFPs allow Single Mode (SM), and Multi-mode (MM) fiber optic non-intrusive tap
- Supports any combination of DS0/64/56/16/8 kbps fractional T1 E1, and N x T1 E1 interface definitions (a total of 252 E1s or 336 T1s – in each port)
- Provides Loss of Signal (LOS) and Loss of Frames (LOF) Hardware Alarms indication, Service logging, External Clock, Line and Diagnostic Loopback options, Through mode and Port Swap Cross-port options
- Supports multiplexing multiple T1 or E1 channels to a single channelized OC-3/12 STM-1/4 line
- User configurable OC-3/STM-1 or OC-12/STM-4 mapping
- Provides an option to restart the SEC service automatically

# Channelized T1 E1 Monitoring





# SonetExpert™ Analyzer GUI

Monitor all T1s or E1s

T1 Sonet Expert Channelized Analyzer 64-bit

File Config View Monitor IntrusiveTest Special Applications Window Help

Port Framing

135	ESF (193E)
136	ESF (193E)
137	ESF (193E)
138	ESF (193E)
139	ESF (193E)
140	ESF (193E)
141	ESF (193E)
142	ESF (193E)
143	ESF (193E)
144	ESF (193E)
145	ESF (193E)
146	ESF (193E)
147	ESF (193E)
148	ESF (193E)
149	ESF (193E)
150	ESF (193E)
151	ESF (193E)
152	ESF (193E)
153	ESF (193E)
154	ESF (193E)

Set all cards as selected

<- Double-click to change values

T1/E1 Alarms

Reset	All Ports	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25
Sync Loss	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Carrier Loss	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Frame Error	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Blue Alarm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yellow Alarm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AIS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

T1/E1 Statistics

Frequency (Hz)	Level (dBdsx)	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25
CRC Errors		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Frame Errors		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transmit Under Run		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Receive Over Run		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ready

T1/E1 Sync Info

# Protocol Analyzers

SS7 Protocol Analysis SS7 ITU 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

Dev TSlot SubCh Frame# TIME (Relative) Len Error OPC MTP3 DPC MTP3 Message Type ISUP Circuit Identification Code ISUP Called Address Signal ISUP Calling Address Signal ISUP Cause Value ISUP

✓ 5	31		0	00:00:07.756250	38		1.1.1	2.2.2	Initial address	30	4265375031	5674532031	
✓ 1	31		1	00:00:08.777875	16		2.2.2	1.1.1	Address complete	30			
✓ 1	31		2	00:00:08.780000	14		2.2.2	1.1.1	Answer	30			
✓ 5	31		3	00:01:09.809500	18		1.1.1	2.2.2	Release	30			Normal call clearing
✓ 1	31		4	00:01:10.834250	14		2.2.2	1.1.1	Release Complete	30			

Card5 TimeSlot=31 Frame=0 at 00:00:07.756250 OK Len=38  
HDLC Frame Data + FCS  
===== MTP2 Layer =====  
0000 BSN = .1011011 (91)  
0000 BIB = 1..... (1)  
0001 FSN = .1011011 (91)  
0001 FIB = 1..... (1)  
0002 LI = ..100001 MSU Format  
===== MTP3 Layer =====  
0003 Service Indicator = ....0101 ISDN User Part  
0003 Priority Code = ..00.... Priority Code 0  
0003 Sub-service field = 10..... National Network  
0004 DPC = 2.2.2(00010010 ..010000)  
0005 OPC = 1.1.1(01..... 00000010 ....0010)  
0007 Signalling Link Code = 0001.... (1)

Call ID	Call Status	Disp	Calling Num	Called Num	Call Start Date & Time	Call Duration	R
23	ClArR	1	5674532025	4265375025	2018-02-15 16:51:31.099750	00:01:03.068375	
24	ClArR	1	5674532026	4265375026	2018-02-15 16:51:31.104625	00:01:03.083750	
25	ClArR	1	5674532027	4265375027	2018-02-15 16:51:31.109500	00:01:03.080750	
26	ClArR	1	5674532028	4265375028	2018-02-15 16:51:31.114500	00:01:03.077625	
27	ClArR	1	5674532029	4265375029	2018-02-15 16:51:31.119375	00:01:03.074625	
28	ClArR	1	5674532030	4265375030	2018-02-15 16:51:31.125000	00:01:03.081000	
29	ClArR	1	5674532031	4265375031	2018-02-15 16:51:31.129875	00:01:03.078000	

Running. Utilization 20.56%

C:\Program Files\GL Communications Inc\Soft E1 Analy

178 completed 8556782130 7685612930 2018-02-15

179 completed 8556782131 7685612931 2018-02-15

Running. Utilization 0.04%

C:\Program Files\GL Communications Inc\Soft E1 Analyz Captured 2 089 frames

Protocol Capture Configuration

Save Load Default

Capture File Options

Card & Stream Selection

Capture Filter

Gui & Protocol Options

PORT ACTIONS | P.. 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3

1 2 3 4 5 6 7 8 9 10 11 12

Data Transmission Rate  
Single Channel  
64 kbps  
56 kbps  
Hyper-Channel  
Nx64 kbps  
Nx56 kbps (bits 1-7)  
Nx56 kbps (bits 2-8)  
Multiple Hyper-Channels  
128, 192, ... kbps

Subchannels 8-56 kbps  
8 16 24 32 40 48 56

All Port Settings  
HDLC FCS  
16 bits  
32 bits  
None  
Interface  
User  
Network  
Bit Inversion 1<->0  
Octet Bit Reversion (MSB <-> LSB)

Row (Port) Select, Clear, Paste Operations  
Paste operations apply to the clipboard contents created by clicking on a row "C" (copy) button for the port which timeslot selection is served as the source for paste.  
Select All  
Clear All  
Paste All  
Paste Clipboard to Port List  
Paste List



# ISDN Call Capture and Analysis

Packet Data Analyzer - Summary View

File View Call Summary GUI Configurations Help

ISDN Show All Calls

Call Summary Alert Summary

Call #	StartTime	Caller	Callee	CallReference	SourcePort	DestinationPort	TimeSlot	BearerChannel	InterfaceType	InterfaceId	Result	ReleaseCause	Duration	BillingTime(mSec)	S
1	2019-03-04 16:36:24.426	8556782101	7685612901	2	1	2	16	1	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.489	60178	
2	2019-03-04 16:36:24.436	8556782102	7685612902	3	1	2	16	2	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.481	60175	
3	2019-03-04 16:36:24.443	8556782103	7685612903	4	1	2	16	3	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.476	60172	
4	2019-03-04 16:36:24.450	8556782104	7685612904	5	1	2	16	4	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.487	60185	
5	2019-03-04 16:36:24.458	8556782105	7685612905	6	1	2	16	5	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.489	60179	
6	2019-03-04 16:36:24.465	8556782106	7685612906	7	1	2	16	6	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.484	60176	

Column Width

TimeStamp	Frame Number	1	2
00.00.000	8	1:16	2:16
00.00.986	19	1:16	2:16
00.00.989	20	1:16	2:16
00.00.990	21	1:16	2:16
00.01.153	40	1:16	2:16
01.01.168	66	1:16	2:16
01.01.325	73	1:16	2:16
01.01.489	81	1:16	2:16

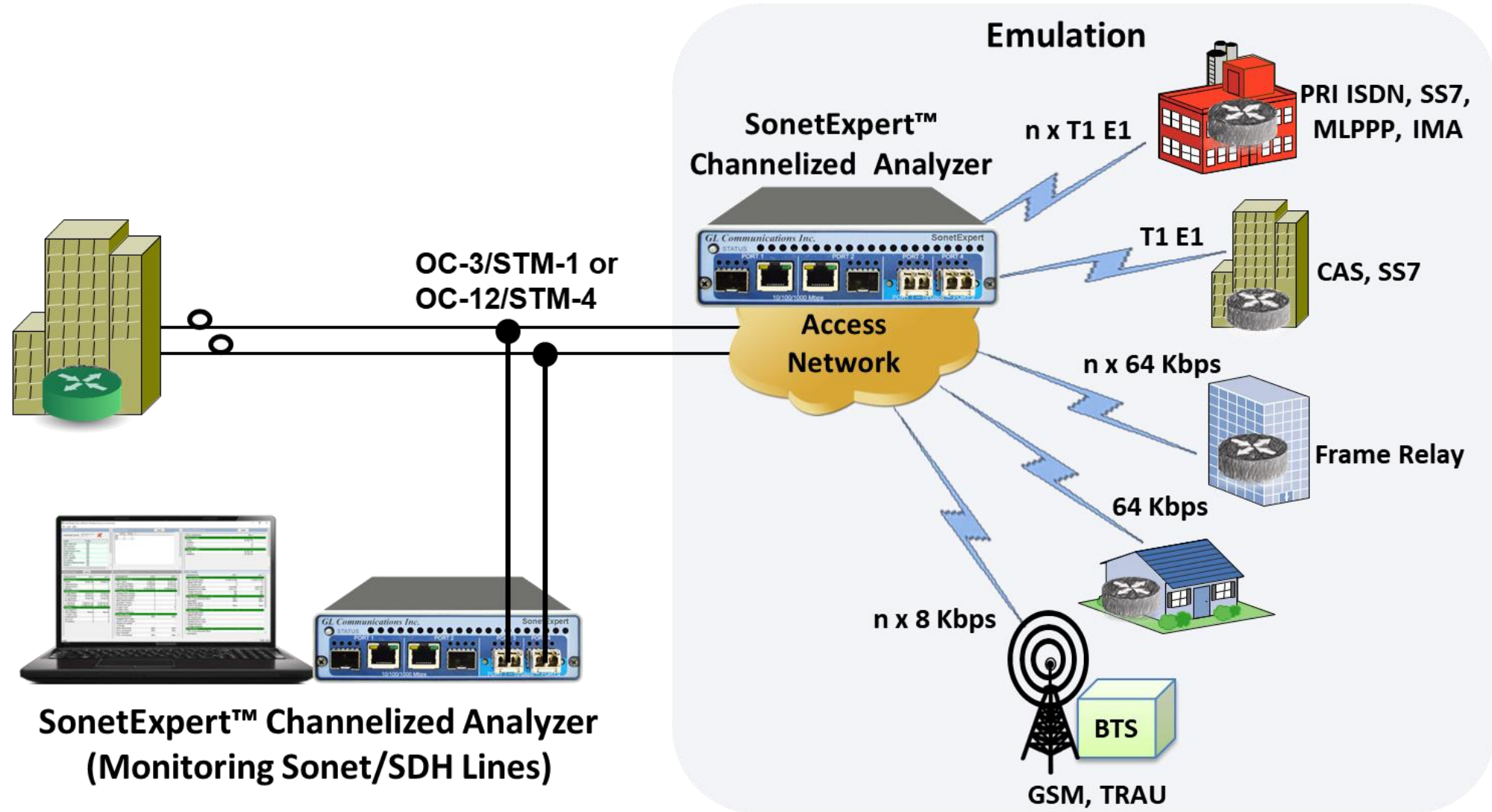
Find

```
===== LAPD Layer =====
C/R      = .....0.. Command(User) Response(Network)
SAPI     = 000000.. (0)
TEI      = 0000000.. (0)
Ctrl     = .....0 Information
N(S)     = 0000000.. (0)
P        = .....0 (0)
N(R)     = 0000000.. (0)

===== Q.93x Layer =====
Protocol Discriminator = 00001000 Q931/I.461 user-network call control
Call Reference Length  = ....0010 (2)
Call Reference Value   = 2 (.00000000 00000010)
Call Reference Flag    = 0..... FROM side that originated call
Message Type          = 00000101 SETUP
  IEI Bearer Capability = 00000100 Bearer Capability IE Identifier
  IE Bearer Capability Length = 3 (x03)
  Information Transfer Capability = ...00000 Speech
  Coding Standard         = .00..... ITU_T (CCITT) standardized coding
  Information Transfer Rate = ...10000 64 kbit/s
  Transfer Mode           = .00..... Circuit Mode
  User Information Layer 1 Protocol (LLC) = ...00011 A-law Rec G.711
  User Information Layer 1 Protocol Ident = .01..... (1)
  IEI Channel Identification = 00011000 Channel Identification IE Identifier
  IE Channel Identification Length = 3 (x03)
```

Active Calls Graph Call Graph Call Summary

# SonetExpert™ Channelized T1 E1 Emulation



# MAPS™ Call Generation, Reception, and Statistics

- Generating 1890 calls continuously

The image displays three screenshots of the MAPS (Message Automation Protocol Simulation) SSP (ISUP ITU) software interface, demonstrating its capabilities in call generation, reception, and statistics.

**Top Left Screenshot: Call Generation - BulkCall\_Ports-1--63**

Sl No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	Isup_Call.gls	Card1TS01	2.1.2.1.1.1	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
2	Isup_Call.gls	Card1TS02	2.1.2.1.1.2	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
3	Isup_Call.gls	Card1TS03	2.1.2.1.1.3	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
4	Isup_Call.gls	Card1TS04	2.1.2.1.1.4	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
5	Isup_Call.gls	Card1TS05	2.1.2.1.1.5	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
6	Isup_Call.gls	Card1TS06	2.1.2.1.1.6	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
7	Isup_Call.gls	Card1TS07	2.1.2.1.1.7	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
8	Isup_Call.gls	Card1TS08	2.1.2.1.1.8	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
9	Isup_Call.gls	Card1TS09	2.1.2.1.1.9	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
10	Isup_Call.gls	Card1TS10	2.1.2.1.1.10	Stop	Transmitting File	Terminate Call		Pass	Infinite	12
11	Isup_Call.gls	Card1TS11	2.1.2.1.1.11	Stop	Transmitting File	Terminate Call		Pass	Infinite	12

**Bottom Left Screenshot: Message Sequence**

Sequence diagram showing the interaction between MAPS and DUT (Device Under Test):

```

sequenceDiagram
    participant MAPS
    participant DUT
    MAPS->>DUT: Initial Address 17.12.57.227.713
    DUT->>MAPS: Address Complete 17.12.58.176.5325
    DUT->>MAPS: Answer 17.12.58.176.5901
    
```

**Top Right Screenshot: Call Reception**

Sl No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Results
7	SLTM.gls		1.7.1.2.7.2.1	Stop	MTP3 Active	Initiate SLTM		Pass
8	SLTM.gls		1.8.1.2.8.2.1	Stop	MTP3 Active	Initiate SLTM		Pass
9	Isup_Call.gls	Card1TS01	1.1.1.2.1.2.1	Stop	File Sent	Terminate Call		Pass
10	Isup_Call.gls	Card1TS02	1.1.1.2.1.2.2	Stop	File Sent	Terminate Call		Pass
11	Isup_Call.gls	Card1TS03	1.1.1.2.1.2.3	Stop	File Sent	Terminate Call		Pass
12	Isup_Call.gls	Card1TS04	1.1.1.2.1.2.4	Stop	File Sent	Terminate Call		Pass
13	Isup_Call.gls	Card1TS05	1.1.1.2.1.2.5	Stop	File Sent	Terminate Call		Pass
14	Isup_Call.gls	Card1TS06	1.1.1.2.1.2.6	Stop	File Sent	Terminate Call		Pass
15	Isup_Call.gls	Card1TS07	1.1.1.2.1.2.7	Stop	File Sent	Terminate Call		Pass

**Bottom Right Screenshot: Statistics**

Call Stats | Message Stats | Reset

Statistic Name	Total Calls	Active Calls	Completed Calls	Passed Calls	Failed Calls	Calls/Sec
Default	343988	1898	342090	342090	0	0

Call Success Ratio | Call graph | Call Rate Distribution

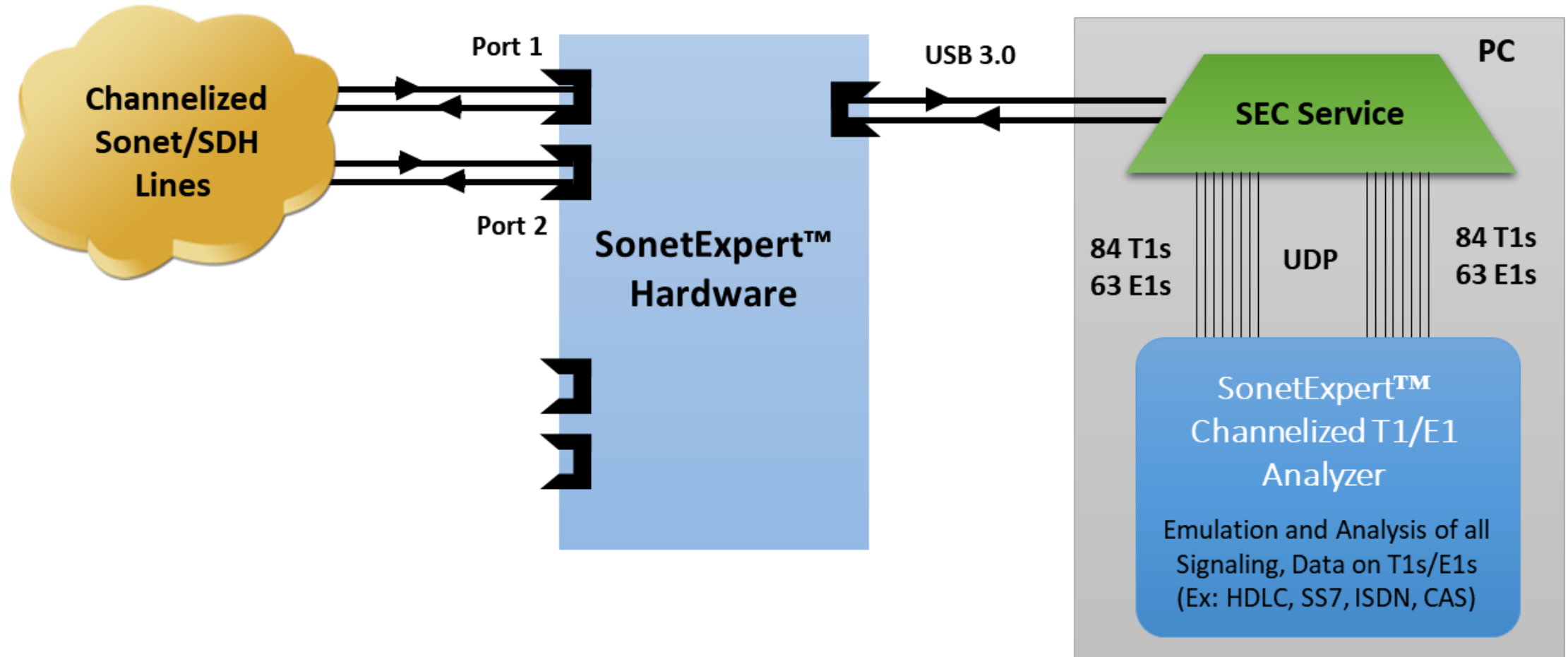
Calls Success Ratio

Passed Calls: 342090  
Failed Calls: 0

Initialisation Errors | Error Events | Captured Errors | Link Status Up=8 Down=0



# Working Principle



# SonetExpert™ Monitor and Control Application (OC-3)

OC3 Sonet Expert Service Monitor

File Log Help

Summary Info

Sonet Expert Service: **RUNNING**

Attrib	Value
UDP remote port	20012
UDP local port	20011
Tx event name	SECH_TX_EVENT
Shared memory name	SECH_SMEM
SONET ports	1-2
STM-1 streams	1
T1/E1 channels	1-63
VC mapping	E1_VC3
Channel numbering scheme	Lucent
Enable Tx	YES
Enable broadcast	no
Broadcast src channel	1
Broadcast source STM-1	1
Clock Port 1	Internal
Clock Port 2	Internal
Crossport 1	None
Crossport 2	None
Loopback 1	None
Loopback 2	None

Hardware Alarms

	Port1	Port2
LOF	✓	✓
LOS	✓	✓

Hardware (FPGA) Counters

FPGA Counter\Port#	Port 1	Port 2
<b>- Receive Counters</b>		
Frames	5 088 097	5 088 097
Overflows	0	0
B1 Errors	0	0
Frame Errors	0	0
<b>- Transmit Counters</b>		
Frames	5 088 098	5 088 097
Underflows	0	0

Receive Counters

Attribute\Port#	port 1	port 2
<b>- Received (calcul...)</b>		
Frames	5 072 184	5 072 158
Frame Len Errors	0	0
Sequence Errors	0	0
B1 Errors	0	0
<b>- FPGA (hardware)</b>		
Tx App Packets	5 072 173	5 072 173
Tx FPGA Underr...	0	0
Rx App Packets	5 072 173	5 072 174
Rx FPGA Overruns	0	0
Tx App Bytes	12 325 380 390	12 325 382 820
Rx App Bytes	12 325 382 820	12 325 382 820
<b>- STM Info</b>		
Rx Unaligned Fr...	0	0
UDP Rx Datagrams	317 014	317 014
Tx Buffer Overfl...	0	0

Rx Demux Counters

Attribute\Port#	port 1	port 2
<b>- Rx Demux Frames ...</b>		
STM-1 Frames	8 337 680	8 337 654
High-Order VC Frames	25 012 983	25 012 959
Processed STM1 Mul...	6 253 245	6 253 239
Extracted T1/E1 Bytes	16 804 118 016	16 804 279 296
<b>- Rx Demux Errors</b>		
Misaligned STM-1 Fr...	0	0
Non Tug2 Ho-VC Pa...	0	0
Unknown STM-1 Fra...	1	1
High-Order MF Add ...	3	0
Discarded VC Frames	3	0
MF SYNC Loss Count	3	0
B2 Parity Count	18	0
B3 Parity Count	3	0
Rx Buffer Overflow ...		
<b>- Rx Demux Alarms</b>		

Tx Mux Counters

Attribute\Port#	port 1	port 2
<b>- Tx Mux Statistics</b>		
Received T1/E1 B...	16 814 859 264	16 814 859 264
Skipped T1/E1 Bytes	0	0
Idle Channel Count	0	0
Generated HO VC ...	25 028 763	25 028 979
Generated STM-1 ...	8 342 921	8 342 993
TxEngine free bytes	N/A	N/A
TxEngine used bytes	N/A	N/A
<b>- Tx Mux Alarms</b>		
STM-1 Frame Gen...	Alarm	Alarm
Input Alarms	Alarm	Alarm
Skipped Bytes Alar...	-	-
No HO VC Gen Ala...	Alarm	Alarm
Idle Channel Alarms	-	-

Ready

NUM


Hardware (FPGA) Counters

Tx Mux Counters

# SonetExpert™ Monitor and Control Application (STM-1)

STM-1 Sonet Expert Service Monitor

File Log Help

Sonet Expert Service: **RUNNING** 

### Summary Info

Attrib	Value
UDP remote port	20012
UDP local port	20011
Tx event name	SECH_TX_EVENT
Shared memory name	SECH_SMEM
SDH ports	1-2
STM-1 streams	1
T1/E1 channels	1-63
VC mapping	E1_VC3
Channel numbering scheme	Lucent
Enable Tx	YES
Enable broadcast	no
Broadcast src channel	1
Broadcast source STM-1	1
Clock Port 1	Internal
Clock Port 2	Internal
Crossport 1	None
Crossport 2	None
Loopback 1	None
Loopback 2	None

### Hardware Alarms

	Port1	Port2
LOF	✓	✓
LOS	✓	✓

### Hardware (FPGA) Counters

FPGA Counter\Port#	Port 1	Port 2
<b>- Receive Counters</b>		
Frames	667 350 651	667 350 654
Overflows	0	0
B1 Errors	0	0
Frame Errors	0	0
<b>- Transmit Counters</b>		
Frames	667 350 650	667 350 655
Underflows	0	0
<b>- Rx/Tx Frequency</b>		
Rx Freq	155 520 000	155 520 000
Tx Freq	155 520 000	155 520 000

### Receive Counters

Reset

Attribute\Port#	port 1	port 2
<b>- Received (calculated)</b>		
Frames	667 350 502	667 350 502
Frame Len Errors	0	0
Sequence Errors	0	0
B1 Errors	0	0
<b>- FPGA (hardware)</b>		
Tx App Packets	667 350 502	667 350 502
Tx FPGA Underruns	0	0
Rx App Packets	667 350 502	667 350 502
Rx FPGA Overruns	0	0
Tx App Bytes	1 621 661 717 430	1 621 661 722 290
Rx App Bytes	1 621 661 719 860	1 621 661 722 290
<b>- SONET/SDH Info</b>		
Rx Unaligned Frames	0	0
UDP Rx Datagrams	41 709 408	41 709 408
Tx Buffer Overflows	0	0
Invalid Udp LoPorts	0	0
Mux Errors	0	0
Tx Overruns	0	0

### Rx Demux Counters

Attribute\Port#	port 1	port 2
<b>- Rx Demux Frames Received</b>		
STM-1 Frames	709 321 261	709 316 270
High-Order VC Frames	2 127 953 685	2 127 938 811
Processed OC-3/STM-1 Mul...	531 988 419	531 984 702
Extracted T1/E1 Bytes	1 429 899 633 792	1 429 899 674 112
<b>- Rx Demux Errors</b>		
Misaligned OC-3/STM-1 Fra...	0	0
Non Tug2 Ho-STS/VC Payload	0	0
Unknown OC-3/STM-1 Fra...	1	1
High-Order MF Add Count	6	3
Discarded STS/VC Frames	6	3
MF SYNC Loss Count	6	3
B2 Parity Count	3 365	3 332
B3 Parity Count	3	3
Rx Buffer Overflow Count		
<b>- Rx Demux Alarms</b>		
No Frames Received	Alarm	Alarm
Unaligned OC-3/STM-1 Fra...	-	-
Unknown OC-3/STM-1 Payl...	-	-
Unknown STS/VC Payload	-	-
STS/VC MF Add	-	-
Bytes not Extracted	Alarm	Alarm
HO STS/VC not Received	Alarm	Alarm
HO STS/VC Discarded	-	-
OC-3/STM-1 not Processed	Alarm	Alarm
Sync Loss	-	-

### Tx Mux Counters

Attribute\Port#	port 1	port 2
<b>- Tx Mux Statistics</b>		
Received T1/E1 Bytes	1 429 919 834 112	1 429 919 834 112
Skipped T1/E1 Bytes	0	0
Idle Channel Count	0	0
Generated HO STS/VC C...	2 127 998 343	2 127 998 295
Generated OC-3/STM-1 ...	709 332 781	709 332 765
TxEngine free bytes	N/A	N/A
TxEngine used bytes	N/A	N/A
<b>- Tx Mux Alarms</b>		
OC-3/STM-1 Frame Gene...	Alarm	Alarm
Input Alarms	Alarm	Alarm
Skipped Bytes Alarms	-	-
No HO STS/VC Gen Alarms	Alarm	Alarm
Idle Channel Alarms	-	-

Ready NUM

# SonetExpert™ Channelized Configuration Utility

- Sonet/SDH parameters
- OC-3/STM-1, T1 E1 ports, Channels and Mapping
- Clock setting of Sonet/SDH ports
- Cross port and loopback settings

OC-3 Configuration Utility

The screenshot shows the 'Sonet Expert Configuration OC-3' window. It contains several sections: 'UDP Ports and Tx Event' with fields for UDP remote port (20012), UDP local port (20011), Tx Event Name (SECH\_TX\_EVENT), and Shared Memory Name (SECH\_SMEM); 'OC3, T1/E1 Ports, Channels and Mapping' with fields for OC-3 Ports (1), OC-3 Streams (1), T1/E1 Channels (1-63), STS Mapping (E1\_STS-1), Channel Numbering Scheme (Lucent), and Enable Tx (checked); 'Broadcast Settings' with fields for Enable Broadcast (unchecked), Broadcast Source Channel (1), and Broadcast Source OC-3 (1); 'Clock Settings' with fields for Clock Port1 (Internal) and Clock Port2 (Internal); 'Crossport Settings' with fields for Crossport Port1 (None) and Crossport Port2 (None); and 'Loopback Settings' with fields for Loopback Port1 (None) and Loopback Port2 (None). On the right side, there are buttons for OK, Expand All, Collapse All, Set Default, and Cancel. At the bottom, there is a text box for 'UDP remote port' with the description: 'UDP remote port of STM T1/E1 Analyzer to send received STM1 T1/E1 multiframes to, default 20002'.

UDP Ports and Tx Event	
UDP remote port	20012
UDP local port	20011
Tx Event Name	SECH_TX_EVENT
Shared Memory Name	SECH_SMEM

OC3, T1/E1 Ports, Channels and Mapping	
OC-3 Ports	1
OC-3 Streams	1
T1/E1 Channels	1-63
STS Mapping	E1_STS-1
Channel Numbering Scheme	Lucent
Enable Tx	<input checked="" type="checkbox"/>

Broadcast Settings	
Enable Broadcast	<input type="checkbox"/>
Broadcast Source Channel	1
Broadcast Source OC-3	1

Clock Settings	
Clock Port1	Internal
Clock Port2	Internal

Crossport Settings	
Crossport Port1	None
Crossport Port2	None

Loopback Settings	
Loopback Port1	None
Loopback Port2	None

**UDP remote port**  
UDP remote port of STM T1/E1 Analyzer to send received STM1 T1/E1 multiframes to, default 20002

STM-1 Configuration Utility

The screenshot shows the 'Sonet Expert Configuration STM-1' window. It contains several sections: 'UDP Ports and Tx Event' with fields for UDP remote port (20012), UDP local port (20011), Tx Event Name (SECH\_TX\_EVENT), and Shared Memory Name (SECH\_SMEM); 'OC3, T1/E1 Ports, Channels and Mapping' with fields for STM-1 Ports (1), STM-1 Streams (1), T1/E1 Channels (1-63), VC Mapping (E1\_VC3), Channel Numbering Scheme (Lucent), and Enable Tx (checked); 'Broadcast Settings' with fields for Enable Broadcast (unchecked), Broadcast Source Channel (1), and Broadcast Source STM-1 (1); 'Clock Settings' with fields for Clock Port1 (Internal) and Clock Port2 (Internal); 'Crossport Settings' with fields for Crossport Port1 (None) and Crossport Port2 (None); and 'Loopback Settings' with fields for Loopback Port1 (None) and Loopback Port2 (None). On the right side, there are buttons for OK, Expand All, Collapse All, Set Default, and Cancel. At the bottom, there is a text box for 'UDP remote port' with the description: 'UDP remote port of STM T1/E1 Analyzer to send received STM1 T1/E1 multiframes to, default 20002'.

UDP Ports and Tx Event	
UDP remote port	20012
UDP local port	20011
Tx Event Name	SECH_TX_EVENT
Shared Memory Name	SECH_SMEM

OC3, T1/E1 Ports, Channels and Mapping	
STM-1 Ports	1
STM-1 Streams	1
T1/E1 Channels	1-63
VC Mapping	E1_VC3
Channel Numbering Scheme	Lucent
Enable Tx	<input checked="" type="checkbox"/>

Broadcast Settings	
Enable Broadcast	<input type="checkbox"/>
Broadcast Source Channel	1
Broadcast Source STM-1	1

Clock Settings	
Clock Port1	Internal
Clock Port2	Internal

Crossport Settings	
Crossport Port1	None
Crossport Port2	None

Loopback Settings	
Loopback Port1	None
Loopback Port2	None

**UDP remote port**  
UDP remote port of STM T1/E1 Analyzer to send received STM1 T1/E1 multiframes to, default 20002

# Optical Connectors and SFP Modules



**LC Connectors**

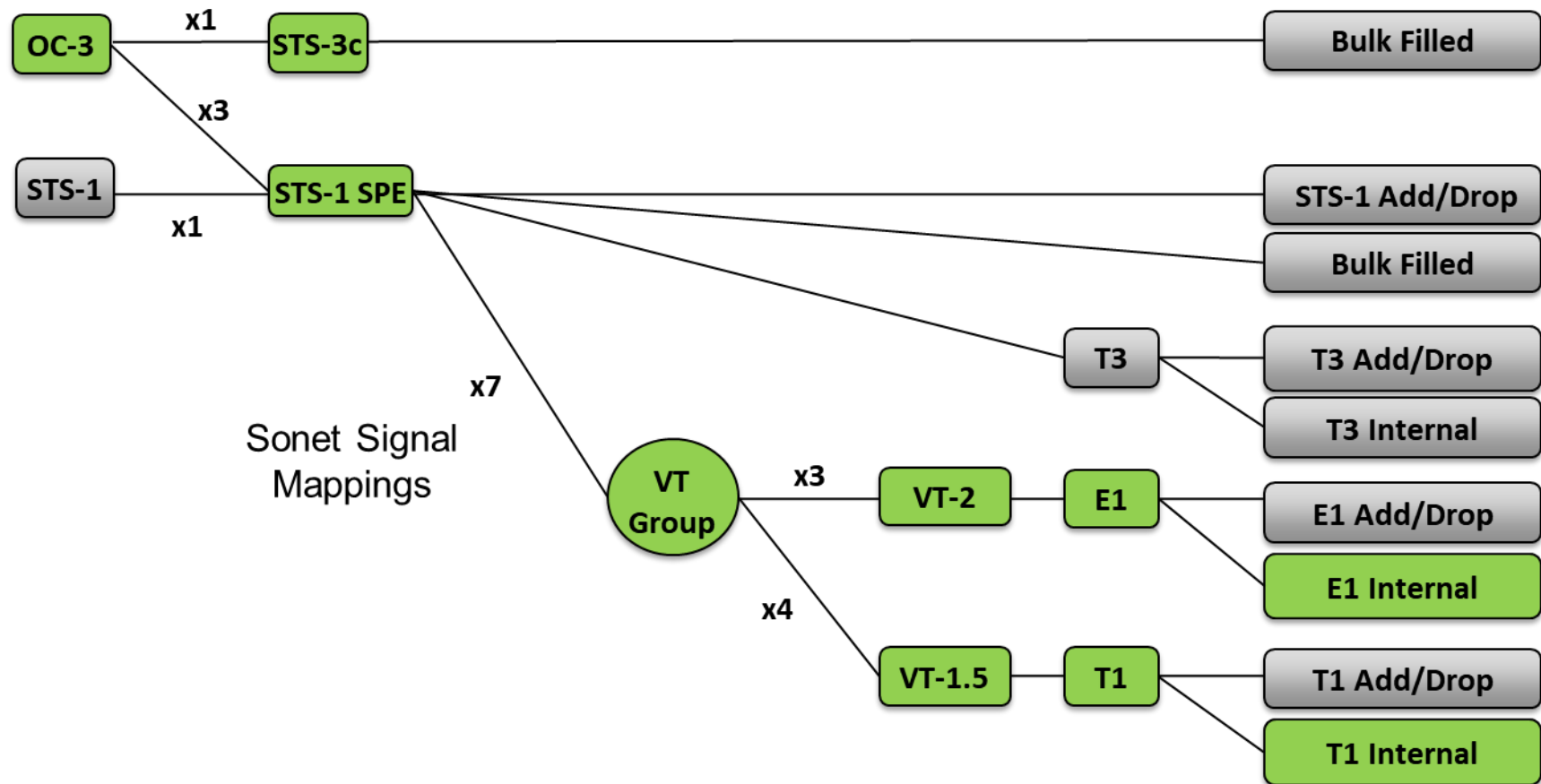


**850 1310 1550 nm SFP Module**



# VC Mapping and Channel Numbering Scheme

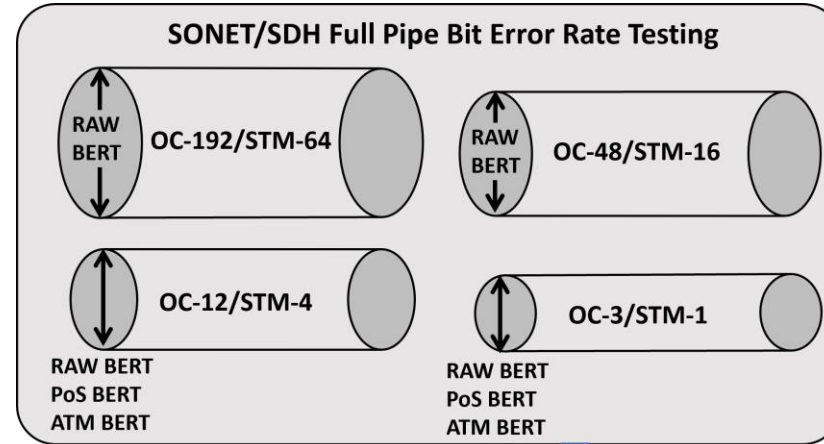
- The paths colored in green are currently supported on the GL's SonetExpert™ hardware



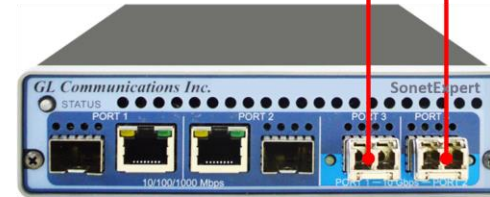
**VT** – Virtual Tributary  
**VTG** – Virtual Container Group  
**STS** – Synchronous Transport Signal  
**SPE** – Synchronous Payload Envelope  
**STS-3c** – Synchronous Transport Signal 3, Concatenated

# Unchannelized Analyzer

- Wirespeed processing of ATM, PoS or RAW data for Tx and Rx for both ports
- Supports BERT testing at rates from OC-3/STM-1 to OC-192/STM-64
- Ability to capture/playback to/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 and POS
- 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/STM-1, OC-12/STM-4 Transparent Payload
  - Analyzer processes Sonet/SDH payload in transparent (RAW) mode without any transport protocols

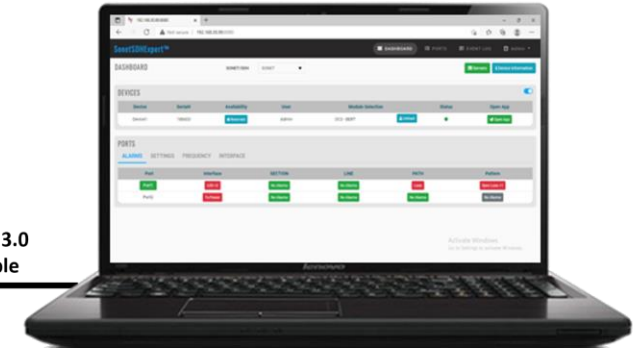


Port 1 and Port 2 Unchannelized Ports  
OC-3/STM-1 to OC-192/STM-64



SonetExpert™ Unchannelized Analyzer  
(Portable)

USB 3.0  
Cable



# SonetExpert™ Monitor and Control GUI Functionalities

- Starting and stopping the SEC service
- Configuring SEC service
- Launching Soft T1 E1 Analyzer
- Viewing and clearing the SEC service log
- Displaying alarms, error counters and operational statistics

**Thank you**