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# SonetExpert™ Channelized Analyzer

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# Introduction

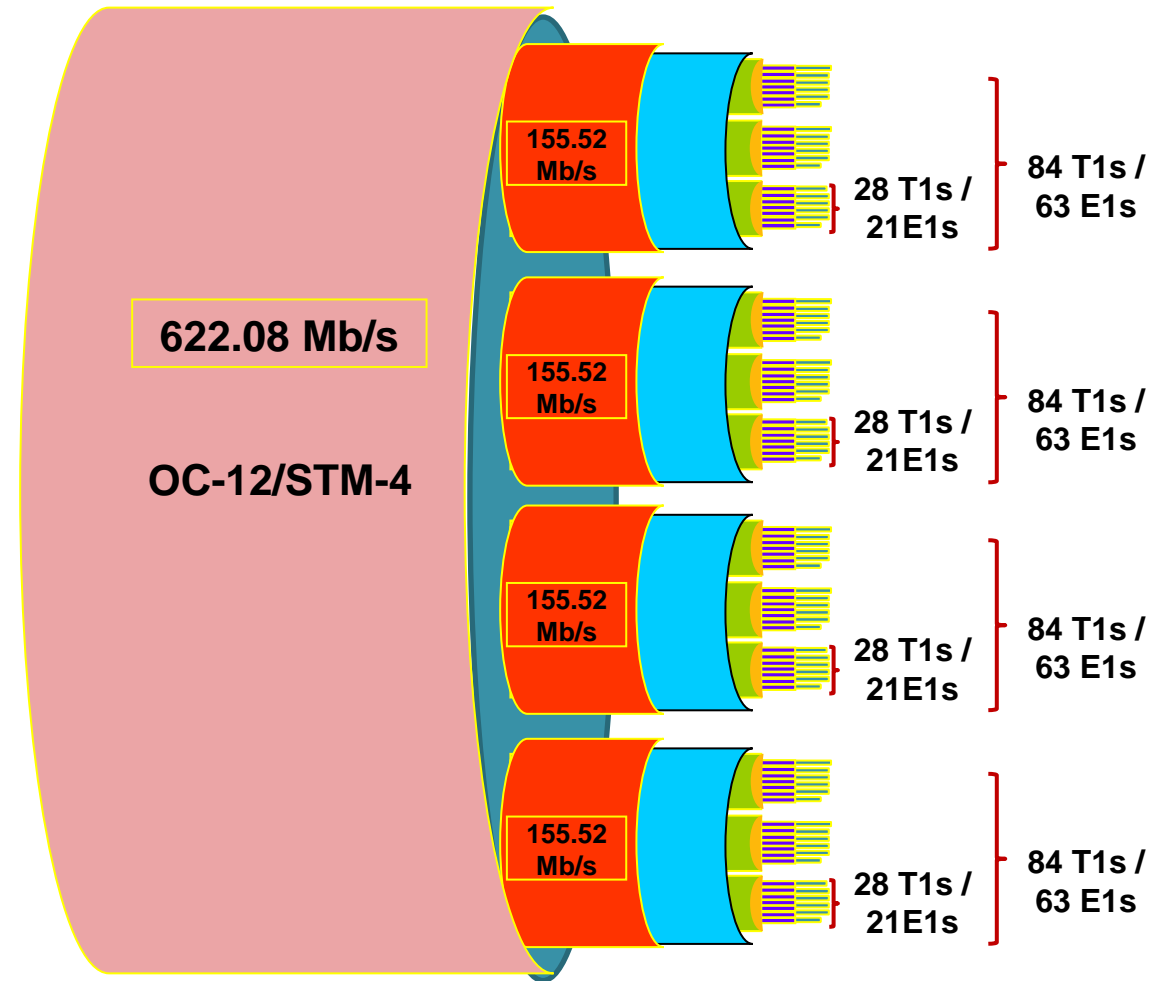
- SONET = Synchronous optical networking. Used in North America
- SDH = Synchronous digital hierarchy. Used in the rest of the world
- SONET and SDH are optical transmission protocols for high-speed data, voice and video traffic
- Data rates
  - SONET: Optical Carrier (OC) - N
  - SDH: Synchronous Transport 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

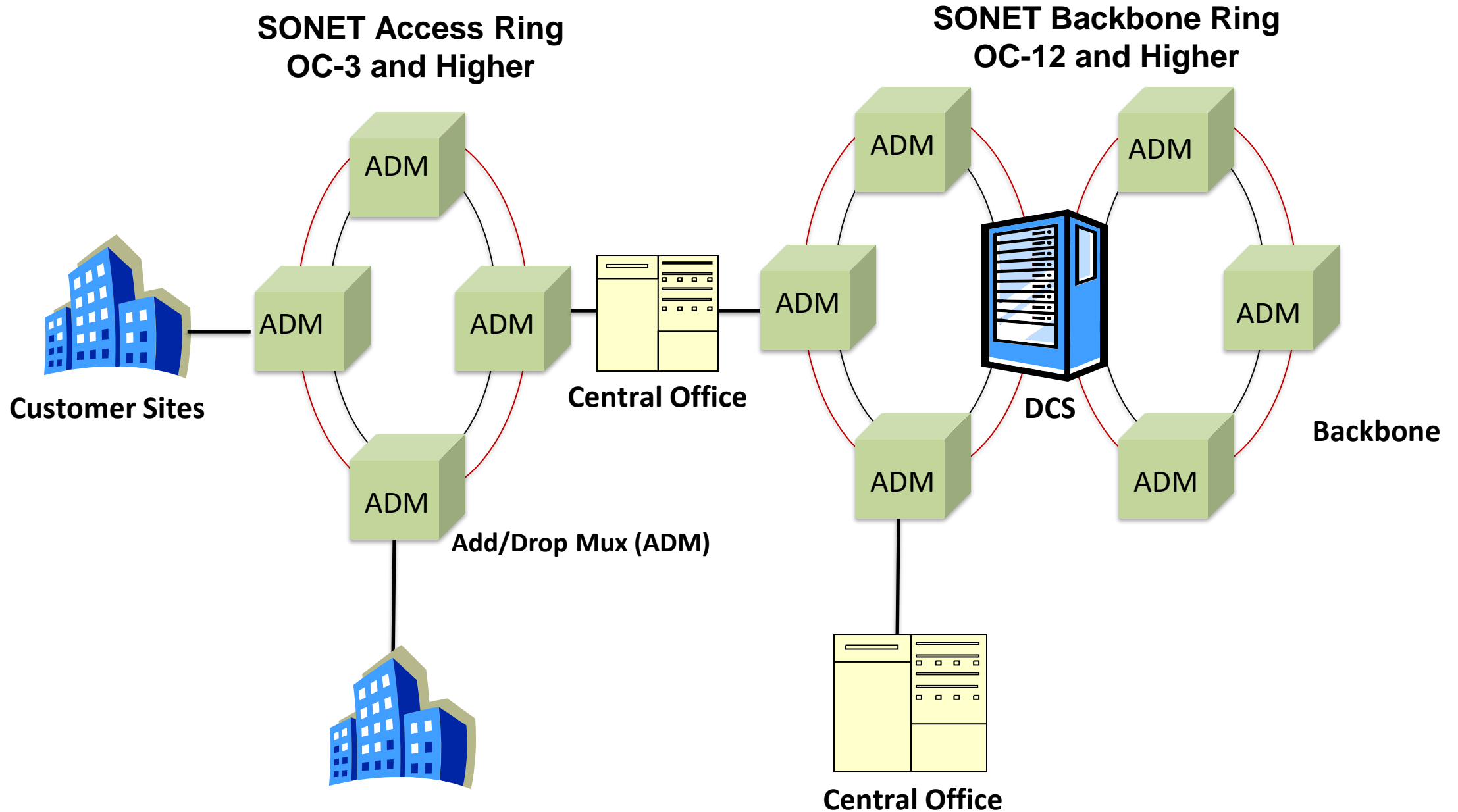
Electrical	Optical (SONET)	Line Rates	SDH Equivalent
STS-1	OC-1	51.84 Mbps	—
STS-3	OC-3	155.52 Mbps	STM-1
STS-9	OC-9	466.56 Mbps	—
STS-12	OC-12	622.08 Mbps	STM-4
STS-18	OC-18	933.12 Mbps	—
STS-24	OC-24	1.2 Gbps	—
STS-36	OC-36	1.9 Gbps	—
STS-48	OC-48	2.5 Gbps	STM-16
STS-96	OC-96	5 Gbps	—
STS-192	OC-192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

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

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



# SONET Network Elements

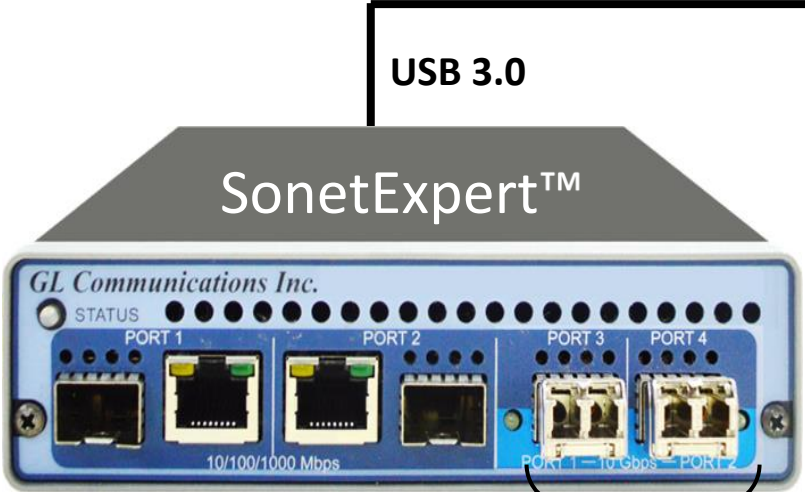


# SONET/SDH Testing Scenarios

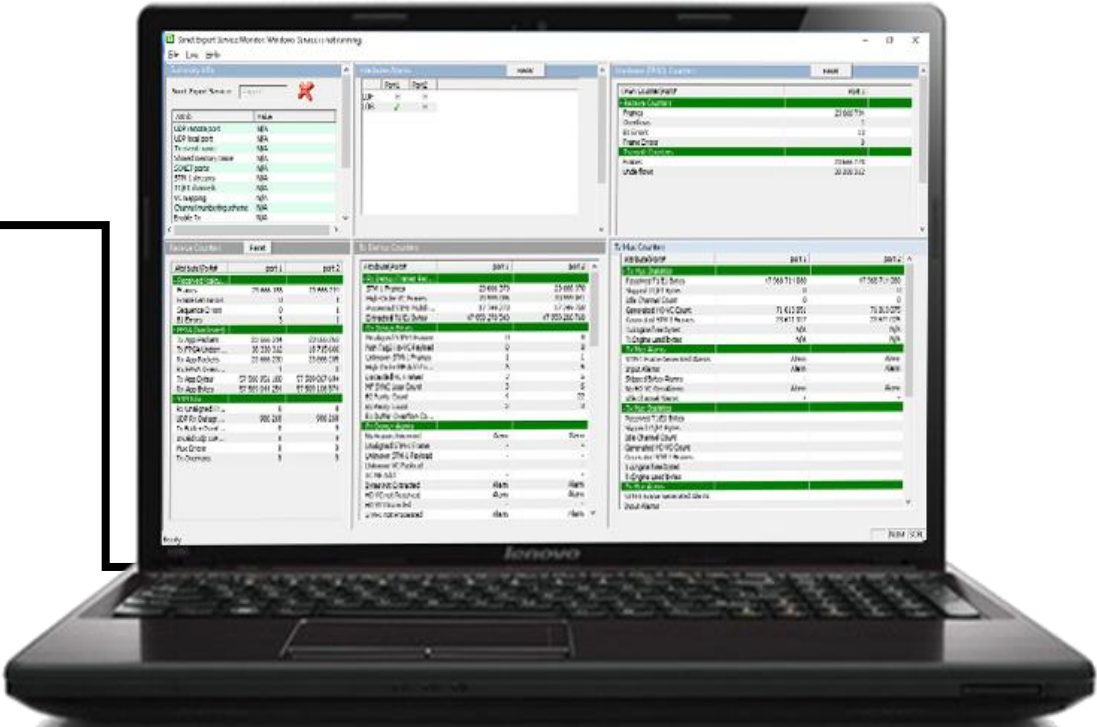
- Monitor T1s, E1s, and DS0s directly without requiring physical access
  - Accessing individual T1 / E1s on a SONET/SDH link
  - Readily identify traffic types within the complex SONET/SDH structure
  - Capturing and analyzing voice calls for call quality or surveillance
- Load testing SONET/SDH network 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™



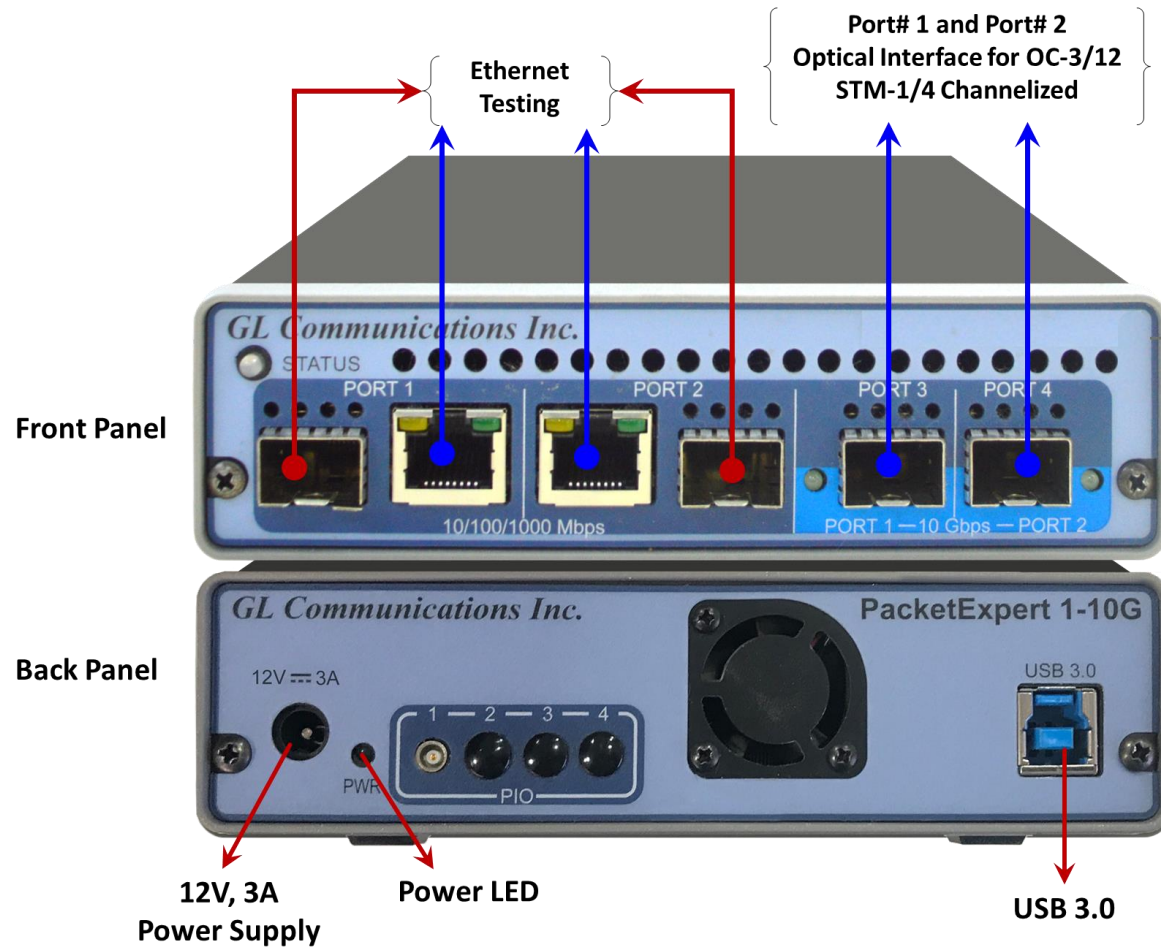
**Channelized Ports  
OC-3/STM-1 and OC-12/STM-4**



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



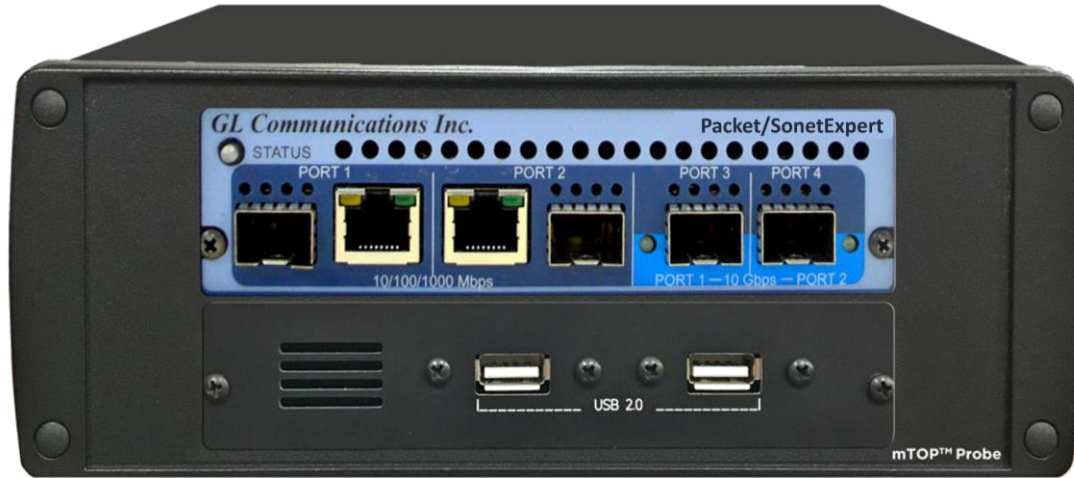
# SonetExpert™ Portable Hardware Unit



Interfaces	<ul style="list-style-type: none"> <li>• 2 x Channelized Ports (STM-1/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

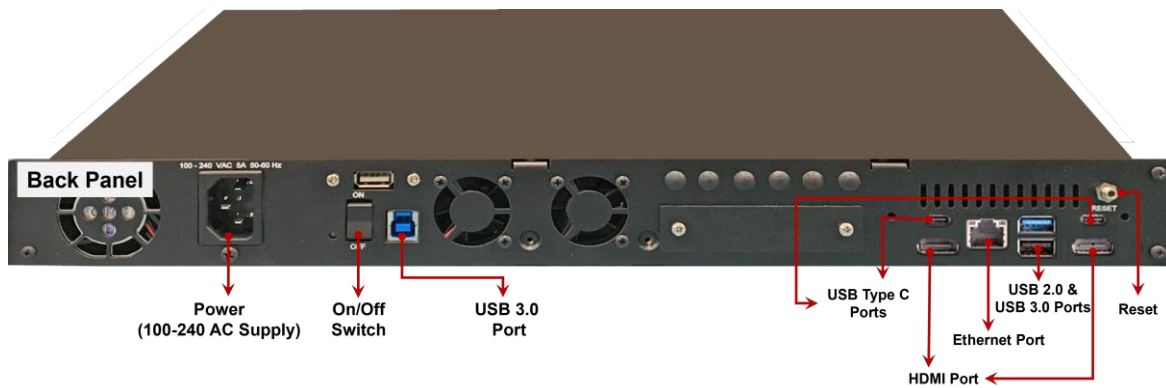
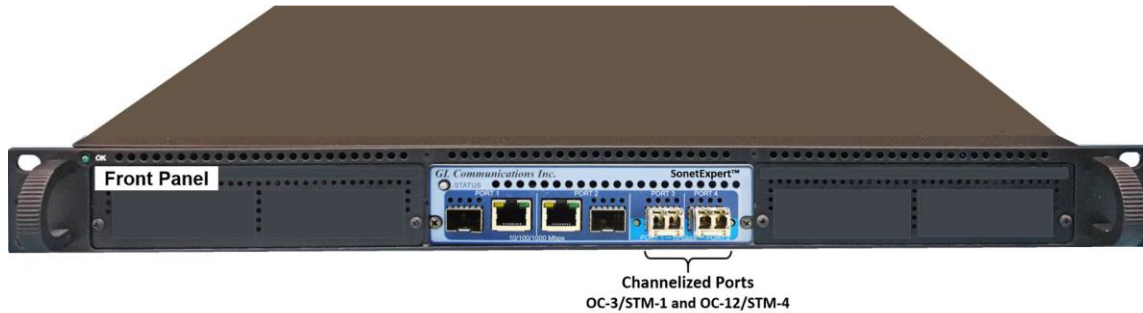
- PacketExpert™ hardware is used for both Packet/SonetExpert™)



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>• Intel Core i3 or optional i7 NUC Equivalent</li> <li>• Windows® 10 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 (STM-1/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>• Intel Core i7, Windows® 10 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>

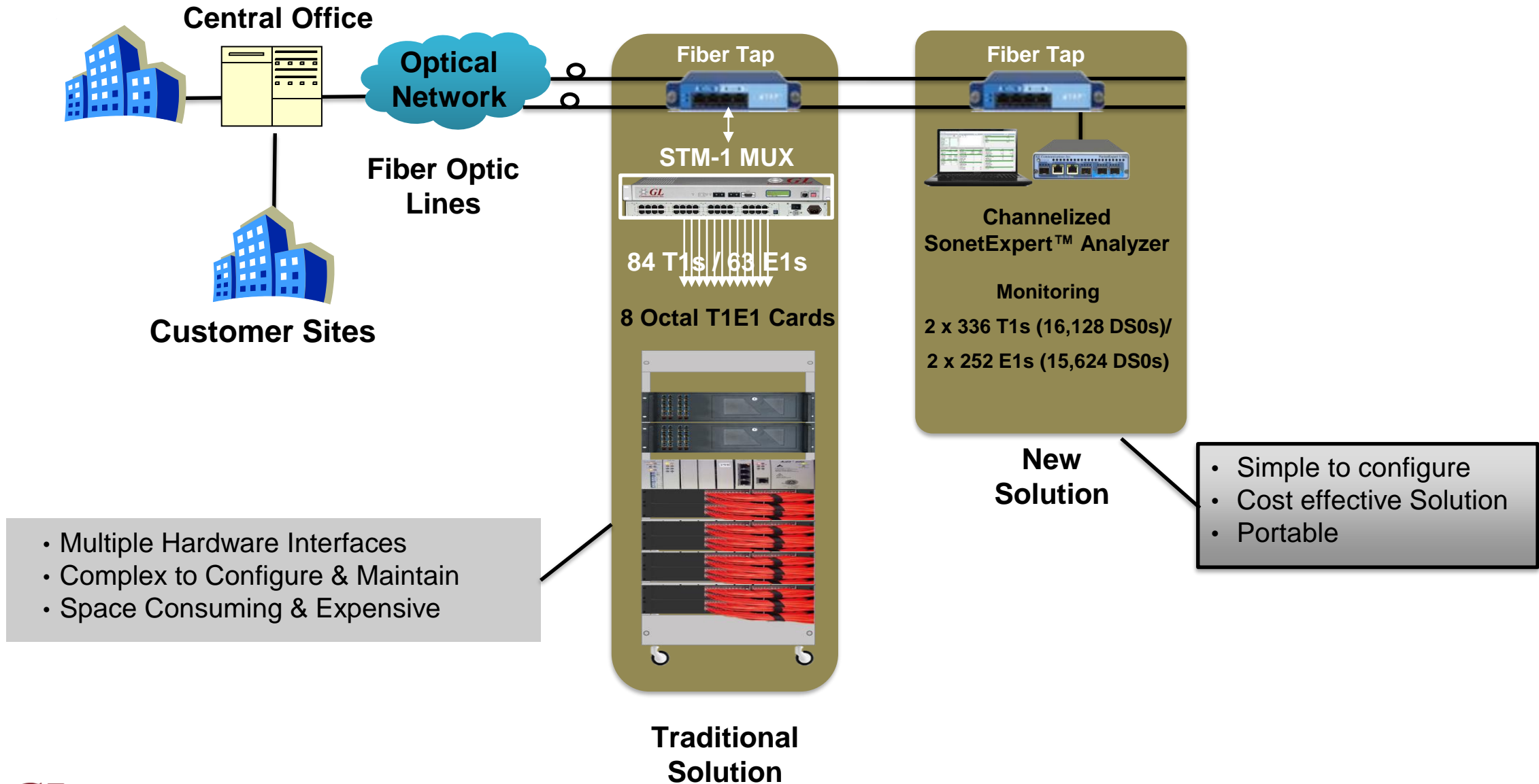
# SonetExpert™ Features

- 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-3/12, STM-1/4 mapping
- Provides an option to restart the SEC service automatically

# Channelized T1 E1 Monitoring



# SonetExpert™ Analyzer GUI

Monitor all T1s / 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 \*\*\* Ric

```

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	Release Complete
23	ClArR	1	5674532025	4265375025	2018-02-15 16:51:31.099750	00:01:03.068375	Normal call c
24	ClArR	1	5674532026	4265375026	2018-02-15 16:51:31.104625	00:01:03.083750	Normal call c
25	ClArR	1	5674532027	4265375027	2018-02-15 16:51:31.109500	00:01:03.080750	Normal call c
26	ClArR	1	5674532028	4265375028	2018-02-15 16:51:31.114500	00:01:03.077625	Normal call c
27	ClArR	1	5674532029	4265375029	2018-02-15 16:51:31.119375	00:01:03.074625	Normal call c
28	ClArR	1	5674532030	4265375030	2018-02-15 16:51:31.125000	00:01:03.081000	Normal call c
29	ClArR	1	5674532031	4265375031	2018-02-15 16:51:31.129875	00:01:03.078000	Normal call c

Running. Utilization 20.56%

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	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	
✓ X	1																													
✓ X	2																													
✓ X	3																													
✓ X	4																													
✓ X	5																													
✓ X	6																													
✓ X	7																													
✓ X	8																													
✓ X	9																													
✓ X	10																													
✓ X	11																													
✓ X	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

None

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 (inset) selection is served as the source for paste.

Select All

Clear All

Paste All

Paste Clipboard to Port List

Paste List

16



# ISDN Call Capture and Analysis

Packet Data Analyzer - Summary View

File View Call Summary GUI Configurations Help

ISDN Show All Calls

Call #	StartTime	Caller	Callee	CallReference	SourcePort	DestinationPort	TimeSlot	BearerChannel	InterfaceType	InterfaceId	Result	ReleaseCause	Duration	BillingTime(mSec)
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

TimeStamp	Frame Number	1	2
00.00.000	8	1:16	2:16
		→ SETUP	←
00.00.986	19	1:16	2:16
		← CALL PROCEEDING	→
00.00.989	20	1:16	2:16
		← ALERTING	→
00.00.990	21	1:16	2:16
		← CONNECT	→
00.01.153	40	1:16	2:16
		→ CONNECT ACKNOWLEDGE	←
01.01.168	66	1:16	2:16
		→ DISCONNECT	←
01.01.325	73	1:16	2:16
		← RELEASE	→
01.01.489	81	1:16	2:16
		→ RELEASE COMPLETE	←

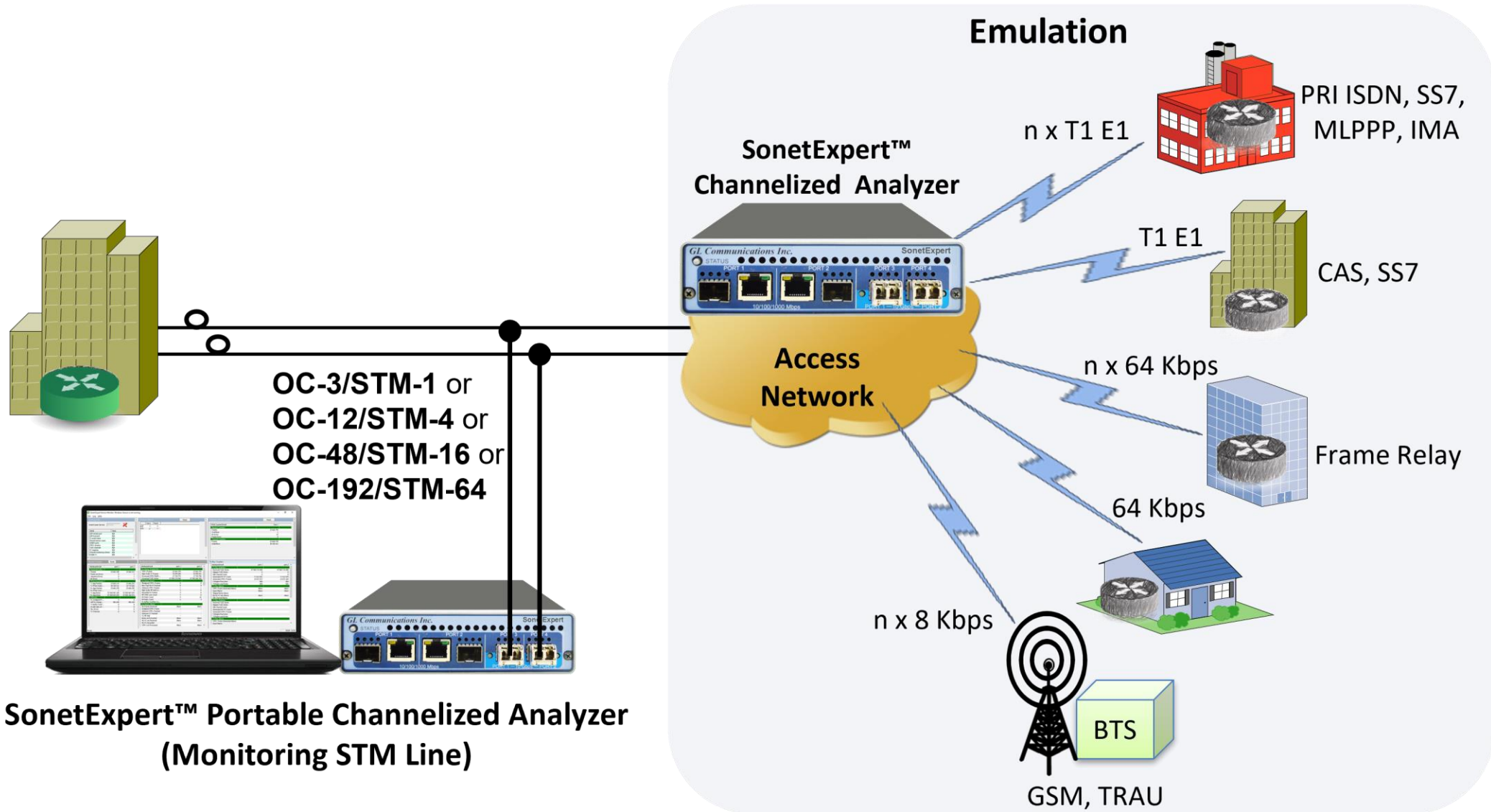
  

```

Find
===== LAPD Layer =====
C/R = .....0. Command(User) Response(Network)
SAPI = 000000.. (0)
TEI = 0000000. (0)
Ctl = .....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 cont
Call Reference Length = ....0010 (2)
Call Reference Value = 2 (.0000000 00000010)
Call Reference Flag = 0..... FROM side that originated callre:
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 codin
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 Ident:
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

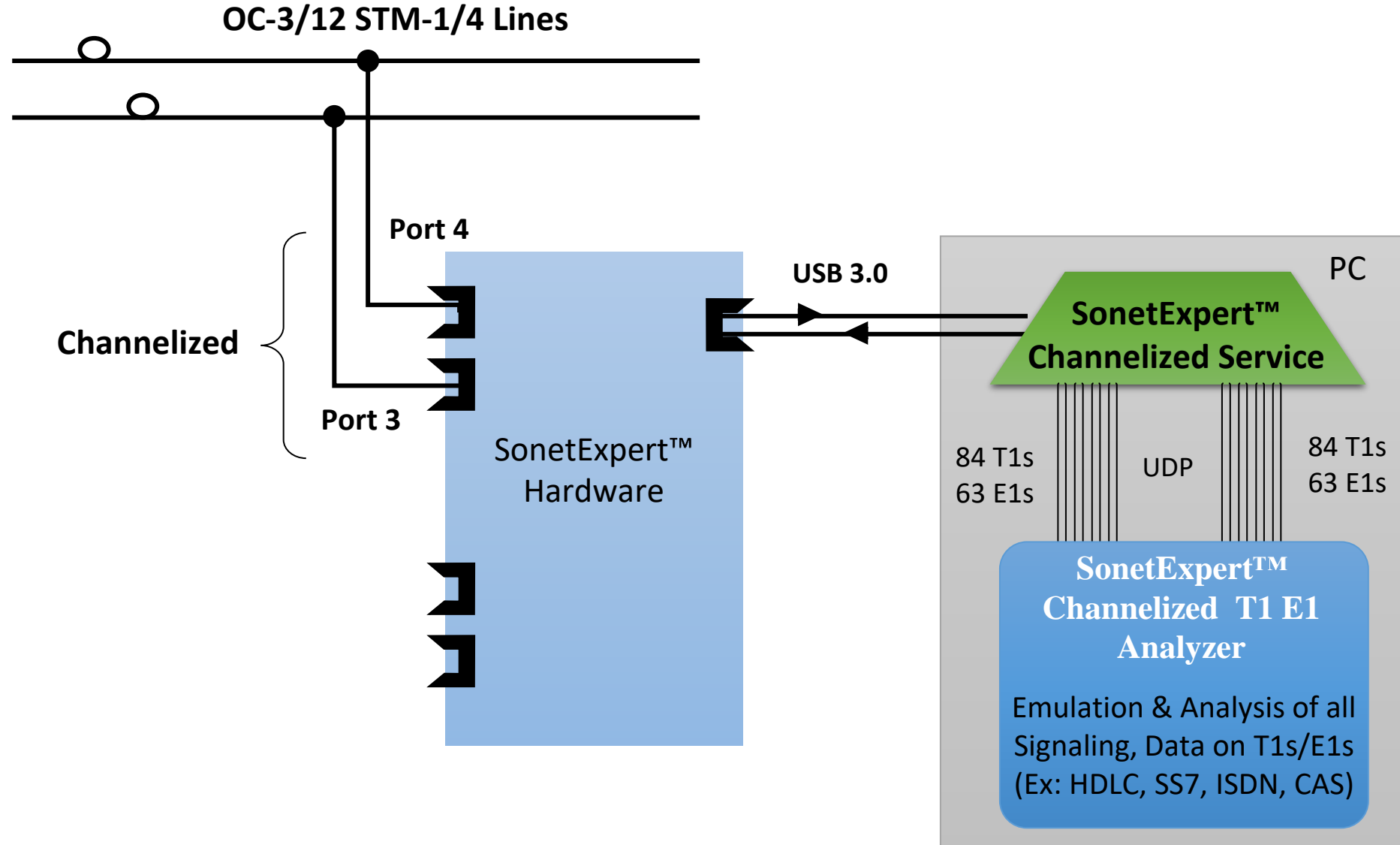
The screenshot displays the MAPS (Message Automation Protocol Simulation) SSP (ISUP ITU) interface, which is used for generating, receiving, and analyzing calls. The interface is divided into several windows:

- Call Generation Window:** Shows a list of 11 call scripts (Sr No 1-11) with columns for Script Name, Profile, Call Info, Script Execution, Status, Events, Events Profile, Result, Total Iterations, and Completed Iterations. The scripts are named 'Isup\_Call.gls' and use profiles 'Card1TS01' through 'Card1TS11'.
- Call Reception Window:** Shows a list of 15 call scripts (Sr No 7-15) with columns for Script Name, Profile, Call Info, Script Execution, Status, Events, Events Profile, Results, and Call Info. The scripts are named 'SLTM.gls' and 'Isup\_Call.gls' and use profiles 'Card1TS01' through 'Card1TS07'. The 'Status' column shows 'Stop' for all scripts, and the 'Events' column shows 'Initiate SLTM' and 'Terminate Call'.
- Statistics Window:** Shows a table of call statistics and a gauge for the Call Success Ratio.

Statistic Name	Total Calls	Active Calls	Completed Calls	Passed Calls	Failed Calls	Calls/Sec
Default	343988	3898	342090	342090	0	0

The Call Success Ratio gauge shows a green circle, indicating a 100% success rate. The legend indicates: Passed Calls: 342090, Failed Calls: 0.

# Working Principle




# SonetExpert™ Monitor and Control Application

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	-	-

Summary Information Panel

Hardware (FPGA) Counters

Receive Counters

Tx Mux Counters

Rx Demux Counters

# SonetExpert™ Channelized Configuration Utility

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

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	1-2
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

**Loopback Port2**  
Loopback Settings Port 2

# Optical Connectors and SFP Modules



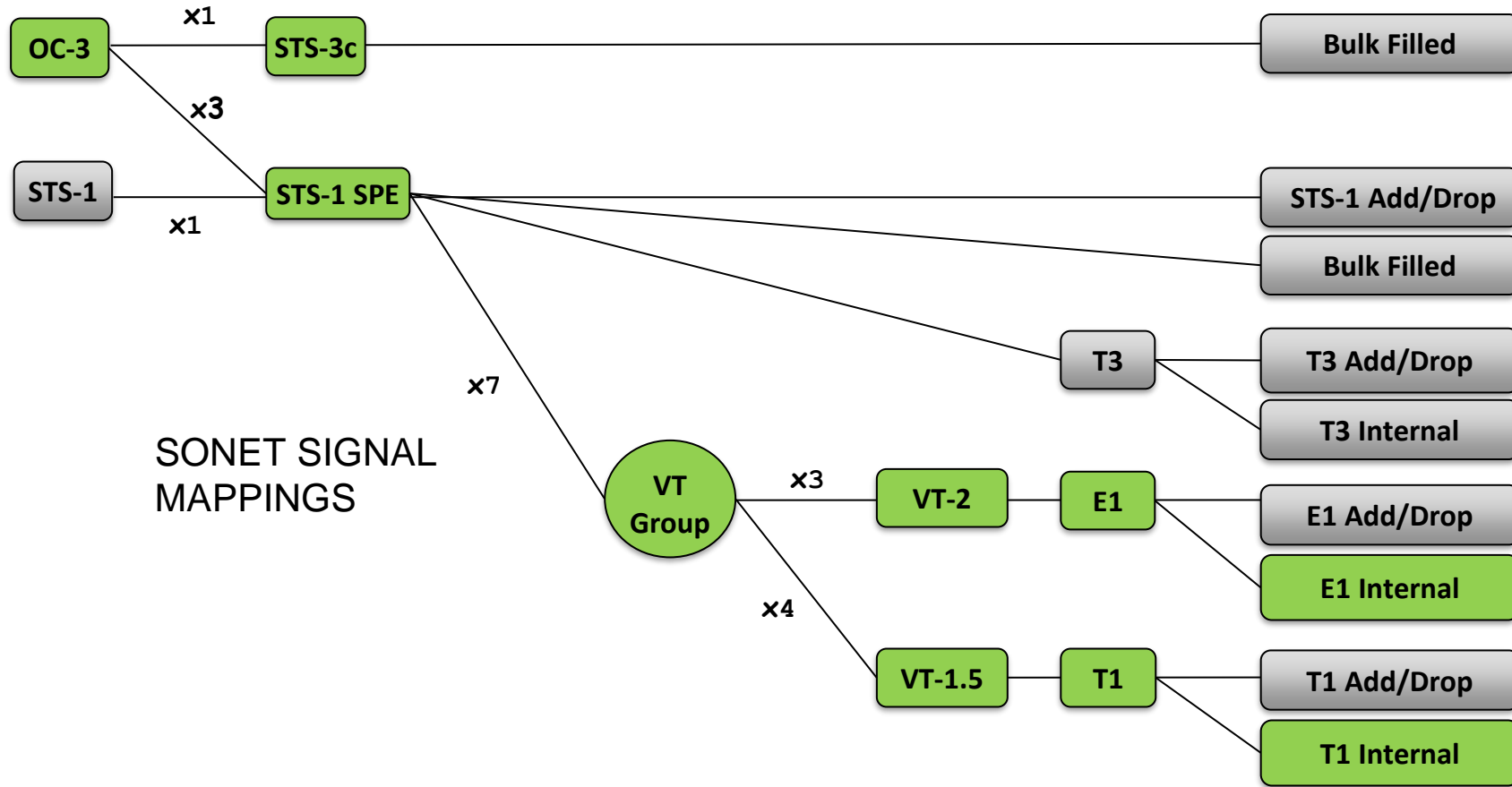
**LC Connectors**



**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

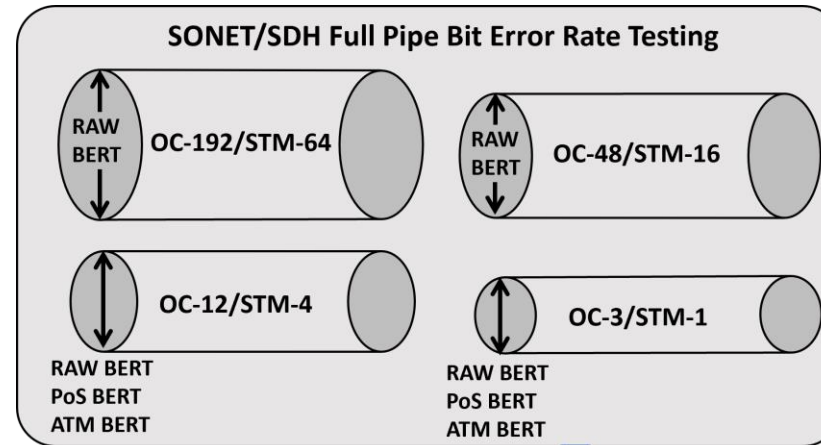


- VT – Virtual Tributary
- VTG – Virtual Container Group
- STS – Synchronous Transport Signal
- SPE – Synchronous Payload Envelope
- STS-3c – Synchronous Transport Signal 3, concatenated

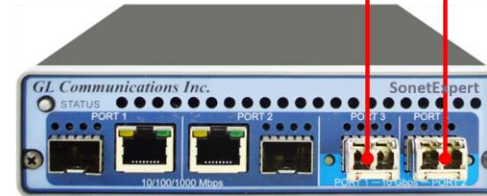


# Unchannelized Analyzer

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

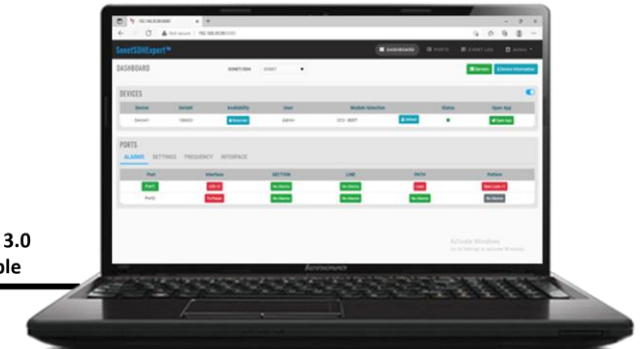


Port 1 and Port 2 Unchannelized Ports  
OC-3/STM-1 to OC-192/STM-64



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