APIs for Test Automation and Remote Access PacketExpert[™] 1G



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PacketExpert[™] 1G Portable Unit - (PXE100)

Interface	 2 x 10/100/1000 Base-T Electrical only
	• 2 x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical
	Single Mode or Multi Mode Fiber SFP support with LC connector
	Optional 4-Port SMA Jack Trigger Board (TTL Input/Output)
Power Supply	 +12 Volts (Medical Grade), 3 Amps
BUS Interface	• USB 2.0
Protocols	RFC 2544 compliance
	 ITU-T Y.1564 (ExpertSAM[™])





10 mTOP™ Rack-Mount Enclosure



- 19" rack option, w/ Embedded Single Board Computer (SBC)
- SBC Specification:
 - Intel Core i3 or optional i7 NUC Equivalent,
 - Windows® 11 64-bit Pro Operating System
 - ➢ USB 3.0 and USB 2.0 Ports, ATX Power Supply
 - USB Type C Ports, Ethernet 2.5GigE port
 - > 256 GB Hard drive, 8G Memory (Min)
 - > Two HDMI ports



PacketExpert[™] 1G High-Density 12/24 GigE Ports mTOP[™] Rack

- PacketExpert[™] SA (PXE112) is a 12-Port PacketExpert[™] w/ Embedded Single Board Computer (SBC)
- SBC Specs: Intel Core i3 or optional i7 NUC Equivalent, Windows® 11 64-bit Pro Operating System, USB 3.0 and USB 2.0 Ports, ATX Power Supply, USB Type C Ports, Ethernet 2.5GigE port, 256 GB Hard drive, 8G Memory (Min), Two HDMI ports
- 19" 1U Rackmount Enclosure (If options, then x 3)
- **PacketExpert[™] SA (PXE124)** is a 24-Port PacketExpert[™] w/ Embedded Single Board Computer (SBC)
- SBC Specs: Intel Core i3 or optional i7 NUC Equivalent, Windows® 11 64-bit Pro Operating System, USB 3.0 and USB 2.0 Ports, ATX Power Supply, USB Type C Ports, Ethernet 2.5GigE port, 256 GB Hard drive, 8G Memory (Min), Two HDMI ports
- 19" stacked 1U Rackmount Enclosure (If options, then x 6)



PacketExpert[™] SA (PXE112)



PacketExpert[™] SA (PXE124)



Different Applications loaded on same Platform



Note: Only one application can run at a time



PacketExpert™ 1G mTOP™ Probe





 Portable Quad Port Ethernet/VLAN/MPLS/IP/UDP Tester with 4 Electrical Ethernet Ports (10/100/1000 Mbps) and 2 Optical Ports (100/1000 Mbps). Embedded with Single Board Computer (SBC)

- SBC Specs: Intel Core i3 or optional i7 NUC Equivalent, Windows® 11 64-bit Pro Operating System, USB 3.0 and USB 2.0 Ports, ATX Power Supply, USB Type C Ports, Ethernet 2.5GigE port, 256 GB Hard drive, 8G Memory (Min), Two HDMI ports
- Each GigE port provides independent Ethernet/VLAN/MPLS/IP/UDP testing at wire speed for applications such as BERT, RFC 2544, and Loopback. BERT is implemented for all layers
- RFC 2544 is applicable for Layers 2, 2.5, and 3, and Loopback is applicable for Layers 2, 3, and 4



Applications



- Bit Error Rate Testing
- RFC 2544
- Loopback
- ITU-T Y.1564

- Multi-Stream Traffic Generator
- RFC 6349
- Record and Playback Traffic
- Wirespeed Network Tap



Applications

- Test and verify QoS Parameters of network devices like Switches/Routers etc.
- End to end testing of network paths for QoS parameters
- In-depth troubleshooting of the Carrier network in the event of network failures or impairments
- QoS testing of Triple-play services to ensure that they fully qualify SLA parameters
- Terrestrial wireless, satellite, and other WAN technologies network validations
- Test VoIP network in real-time conditions to verify if it meets the quality requirements before you deploy
- Testing video on IP networks by emulating the loss and congestion characteristics
- SPF support can be used for Broadband aggregation applications, Metro edge switching, Metro and access multiservice platforms, and are suitable for Fast Ethernet applications



PacketExpert[™] 1G APIs for Test Automation and Remote Access

- ✤ Overview
- ✤ Features
- Working principle
- ☆ MAPS[™] CLI Server API Clients
- Typical Test Systems
- ✤ IPLinkSim

- ITU-T Y.1564 (ExpertSAM™)
- Wire-Speed Record / Playback
- PacketBroker
- Multi-Stream Traffic Generator Analyzer
- ◆ RFC-6349 based TCP Throughput Testing (ExpertTCP™)



Overview





Overview

- With additional licensing, PacketExpert[™] 1G supports Command line Interface (CLI) to access all the functionalities remotely such as Bert, Loopback, RFC 2544, Record Playback, IPNetSim[™], ExpertSAM[™], PacketBroker[™], and Multi Stream Traffic Generator and Analyzer using Python, C# client APIs and MAPS[™] CLI Client/Server architecture
- PacketExpert[™] 1G can be configured as server-side application using the GL's MAPS[™] Client-Server architecture, to provide the capability of remote operation, automation, and multi-site connectivity, using any client-side scripting tools such as the Python, C#
- On the client side, the packaged library file is provided which allows the client interface to communicate with the MAPS[™] CLI Server to perform PacketExpert[™] specific functionalities



Features

- Capability of remote operation, automation and multi-site connectivity using Python/C# client and MAPS™ CLI server
- Scripts for MAC, VLAN, MPLS, IP and UDP layers testing
- Multiple PacketExpert[™] can be controlled remotely from single client application via MAPS[™] CLI server
- Scripts for Bert, Loopback, RFC 2544, Record Playback, IPLinkSim[™], PacketBroker[™], WAN Link Emulation, Multistream Traffic Generation and Analysis, and ExpertSAM[™] testing



PacketExpert[™] 1G CLI with Hardware

High End Notebook PC





Working Principle of MAPS[™] CLI







MAPS[™] CLI Server

- GL's proprietary MAPS[™] CLI Server scripts (*.gls files) developed specifically for PacketExpert[™] implements various PacketExpert[™] functionalities like BERT, RFC 2544, and others
- MAPS[™] CLI Server interfaces internally with low level PacketExpert[™] APIs to access PacketExpert[™] hardware and to perform tasks





MAPS[™] CLI Server (Contd.)

14D
Wi MapsCLI (PACKETEXPERT)
E File Edit View
View Latest Command
1 ·· 2021-1-20 10:31:37 881000 · Start "TestBedDefault yml" ·
1 :: 2021-1-20 10:31:37.995000 : LoadProfile ""
1 :: 2021-1-20 10:31:38.020000 : StartScript 1 "PEX Init.ols" "" 1 :
1 :: 2021-1-20 10:31:38.025000 : UserEvent 1 "InitDevice";
1 :: 2021-1-20 10:31:40.155000 : UserEvent 1 "Set10GType"# "Mode10G"="4x10G_1G";
1 :: 2021-1-20 10:31:40.166000 : UserEvent 1 "StartAliveMonitor";
1 :: 2021-1-20 10:31:42.222000 : UserEvent 1 "LoadModule"# "DeviceId"=1,"ModuleName"="AllPortBert";
1 :: 2021-1-20 10:31:47.167000 : StartScript 2 "PEX_10G_BERT_Main.gls" "" 1 ;
1 :: 2021-1-20 10:31:47.178000 : UserEvent 2 "StartBertModule"# "BoardCount"=1,"MODE10G"="4x10G_1G";
1 :: 2021-1-20 10:31:47.179000 : UserEvent 2 "InitBertModule"# "BoardCount"=1,"MODE10G"="4x10G_1G";
1 :: 2021-1-20 10:31:56.380000 : UserEvent 2 "LoadInterfaceProfile" # "USProfile" = "AllPortBert.pex10G1G.AllPortBert.ifc.xml", "USSubProfile" = "PortIInterfaceConfig";
1 :: 2021-1-20 10:31:59.868000 : UserEvent 2 "LoadBERTProfile" "ProfileName"="AIIPortBert.pex10G1G.AIIPortBert.bert.xml","USSubProfile"="Port11xConfig";
1:: 2021-1-20 10:32:00.035000 : UserEvent 2 "LoadBER Profile* "Profile* "AIIPortBert.pex10G1G.AIIPortBert.bert.xml", "USSuDProfile* = "Port1RxConfig";
1 :: 2021-1-20 10:32:02.343000 : UserEvent 2 "ApplyConfiguration" # "PortIndex" = 1;
1:: 2021-1-20 10:32:02.498000: UserEvent 2 "LoadinterracePointer # "USPronie = AllPortBert.DexIUGIG.AllPortBert.Int.xml", USSubPronie = PortLettracePointerracePointe
1: 2021-1-20 10:32:00.122000: USEREVENT 2 LOADBERT Prome # Promename = AllPortBert, period St. AllPortBert, Dert.xml ; USSubProme = Port21:x0.cml ; ; 1: 2021-1-20 10:32:00 - 12:000 - 12:000 - 12:000 - 12:000 - 12:000 - 12:000 - 12:000 - 12:000 - 12:000 - 12:000
1: 2021-1-20 10:32:06.222000: UserEvent 2: LoadbExt Proline # Prolinevante = AllPortDert.pex10G1G.AllPortDert.pert.dert.xnii ; USSuDProline = Port2kxConing ;
12021-1-20 10.22.00.311000. USELEVENT 2 ApplyComparison + Formulae = 2, 12021-1-20 10.22.06 323000. UserEvent 2 ApplyComparison + Formulae = -//IIDortBart pay10C1C AllDortBart ifc ym!" SSubbrafila"="Dort3InterfaceConfin":
1.: 2021 120 10:32:00 32000 · UserEvent 2 LoadBERTDrofile"# "DrofileName"="AllPortBett period CGL AllPortBett het yml" "ISSubProfile"="Config".
1 ·· 2021 1-20 10:32:10 043000 · UserEvent 2 "LoadBERTProfile"# "ProfileName"="AllPortBert pex10G1G AllPortBert het xml" "LISSubProfile"="Port38xConfig"
1:: 2021-1-20 10:32:12 437000 : UserFvent 2 "ApplyConfiguration"# "PortIndex"=3:
1 :: 2021-1-20 10:32:12.449000 : UserEvent 2 "LoadInterfaceProfile" # "USProfile" = "AllPortBert.pex10G1G.AllPortBert.ifc.xml"."USSubProfile" = "Port4InterfaceConfig":
1 :: 2021-1-20 10:32:13.697000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="AllPortBert.pex10G1G.AllPortBert.bert.xml","USSubProfile"="Port4TxConfig":
1 :: 2021-1-20 10:32:13.797000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="AllPortBert.pex10G1G.AllPortBert.bert.xml","USSubProfile"="Port4RxConfig";
1 :: 2021-1-20 10:32:15.896000 : UserEvent 2 "ApplyConfiguration"# "PortIndex"=4;
1 :: 2021-1-20 10:32:22.246000 : UserEvent 2 "GetInterfaceStatus"# "PortIndex"=1;
1 :: 2021-1-20 10:32:22.291000 : UserEvent 2 "GetInterfaceStatus"# "PortIndex"=2;
1 :: 2021-1-20 10:32:22.335000 : UserEvent 2 "GetInterfaceStatus"# "PortIndex"=3;
1 :: 2021-1-20 10:32:24.384000 : UserEvent 2 "GetInterfaceStatus"# "PortIndex"=4;
1 :: 2021-1-20 10:32:24.429000 : UserEvent 2 "StartRxBert"# "PortIndex"=1;
1 :: 2021-1-20 10:32:24.474000 : UserEvent 2 "StartRxBert"# "PortIndex"=2;
1 :: 2021-1-20 10:32:24,519000 : UserEvent 2 "StartKxBert" # "PortIndex"= 3;
1 :: 2021-1-20 10:32:25.343000 : UserEvent 2 "StarttxBert" # "PortIndex"=4;
1: 2021-1-20 10:32:25.390000: USETCVENT 2 Staft:XBCK1 # POLITICEX = 1;
1. 2021-1-20 10.22.25.45.2000. USELCVEIL 2 Staff XDENT # POLITINEX = z_i 1. 2021-1-20 10.22.25 60000. USELCVEIL 2 Staff XDEDT # "Dottindox"= 2
1 ·· 2021 1 · 20 10.22.26 0.03000 · 0.051 Vell 2 -3 in the left -3 in
The 2017 120 10152-201051000 - OSCIEVENCE States Deliver

• CLI Server script execution is Event Driven, i.e., Server detects the Events such as InsertStatus, InterfaceStatus,

IsRunning, LoadProfileStatus, RFC2544Init, RFC2544TestConfig, TestDirection and others



Python Client and Scripting

- The Python Client consists of following components:
- Python API scripts, that provide High Level APIs, using which all the PacketExpert[™] functionalities are accessible to the users
- These APIs in turn use a low level library to communicate with the PacketExpert[™] MAPS[™] server

	APIs
Use	er Defined Python Scripts
	Python API
	Low Level Library



Executing Sample Python Client

AllFortBert application Initialised Press any key to continue , 'q' to quit Running BERT Test Loading Configuration ************************************
Press any key to continue, 'q' to quit Running BERT Test Loading Configuration ************************************
Running BERT Test Loading Configuration ************************************
Loading Configuration ************************************
Load Configuration Done ************************************

['Up', '00-21-C2-00-09-B4', 'ELECTRICAL', 'Complete', '1000Mops', 'Full Duplex', 'Enable
<pre>['Up', '00-21-C2-00-09-B5', 'ELECTRICAL', 'Complete', 'Housepps', 'Full Duplex', 'Enable ['Up', '00-21-C2-00-09-B6', 'ELECTRICAL', 'Complete', 'Housepps', 'Full Duplex', 'Enable ['Up', '00-21-C2-00-09-B7', 'ELECTRICAL', 'Complete', 'Houseps', 'Full Duplex', 'Enable ************************************</pre>

Port : 4 Tx Started

Bert Results of Port 1 [{'Traffic Status': 'Rx Traffic'}, {'Sync Status': 'InSync'}, {'Bit Error Status': 'No Error'}, {'Out Of Sequence Status': 'No Error'}, {'BERT Status': 'Sync'}, {'BERT Test Time': '00:00:07'}, {'Bits Received': '5 226 410 336'}, {'Bit Error Count': '0'}, {'Bit Error Rate': '0.000E+00'}, {'Bit Error Seconds': '0'}, {'Sync Loss Count': '0'}, {'Sync Loss Seconds': '0'}, {'Out of Sequence Count': '0'}, {'Out of Sequence Seconds': '0'}, {'Error Free Seconds': '7'}]

Bert Results of Port 2
[{'Traffic Status': 'Rx Traffic'},
 {'Sync Status': 'InSync'},
 {'Bit Error Status': 'No Error'},
 {'Out Of Sequence Status': 'No Error'},
 {'BERT Status': 'Sync'},
 {'BERT Test Time': '00:00:07'},



C# Client and Scripting

- The C# interface developed for PacketExpert[™] allows users to control all features of PacketExpert[™] through C# APIs
- The C# client connects to the MAPS[™] CLI server using TCP/IP sockets

	C# Client
1	MAPSClientCSAP1.dll (C# AP1 dll)
	MASClientCAPI.dll
	(C API dll)



Executing Sample C# Client

C:\Program Files\GL Communications Inc\PacketExpertPxeClient\C#\AllPortBert_ConsoleApplication.exe

Port3

Traffic Status: Rx Traffic Sync Status: InSync Bit Error Status: No Error Out Of Sequence Status: No Error BERT Status: Sync BERT Test Time: 00:00:18 Bits Received: 17 012 794 104 Bit Error Count: 0 Bit Error Rate: 0.000E+00 Bit Error Seconds: 0 Sync Loss Count: 0 Sync Loss Seconds: 0 Out of Sequence Count: 0 Out of Sequence Seconds: 0 Error Free Seconds: 19

Port4

Traffic Status: Rx Traffic Sync Status: InSync Bit Error Status: No Error Out Of Sequence Status: No Error BERT Status: Sync BERT Test Time: 00:00:18 Bits Received: 17 071 621 200 Bit Error Count: 0 Bit Error Rate: 0.000E+00 Bit Error Seconds: 0 Sync Loss Count: 0



PacketExpert[™] 1G Integration with LabVIEW using C# Client





LabVIEW All Port BERT Results

Configuration	Interface Details Bert Results	Tx Rx Statistics	Report		
	BERT Results	Port 1	Port 2	Port 3	Port 4
	Traffic Status	Idle	No Rx Traffic	No Rx Traffic	No Rx Traffic
	Sync Status	Idle	InSync	InSync	InSync
	Bit Error Status	Idle	No Error	No Error	No Error
	Out Of Sequence Status	Idle	No Error	No Error	No Error
	BERT Status	Idle	Sync	Sync	Sync
	BERT Test Time	00:01:59	00:01:59	00:01:59	00:01:59
	Bits Received	111 866 884 800	111 852 627 584	111 861 928 832	111 863 056 256
	Bit Error Count	0	0	0	0
	Bit Error Rate	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	Bit Error Seconds	0	0	0	0
	Sync Loss Count	0	0	0	0
	Sync Loss Seconds	0	0	0	0
	Out Of Sequence Count	0	0	0	0
	Out Of Sequence Seconds	0	0	0	0
	Error Free Seconds	119	119	119	119



LabVIEW BERT All Port Statistics





MAPS[™] CLI Server

CI MapsCLI (PACKETEXPERT) -	o x
File Edit View	- 8
View Latest Command	
1 :: 2018-10-26 11:00:51.905000 : Start "TestBedDefault.xml" ;	
1 :: 2018-10-26 11:00:51.978000 : LoadProfile "	
1:: 2018-10-26 11:00:53.241000 : StartScript 1 "PEX_Init.gls" *** 1 ;	
1:: 2018-10-26 11:00:53.254000 : UserEvent 1 InitDevice;	
1:: 2018-10-26 11:00:53.3/5000: UserEvent 1 LoadModule # DeviceId =1, ModuleName = AllPortBert;	
1:: 2018-10-26 11:00:57.350000 : StartScript 2 PEX_DERT_Main.gs 1;	
1:: 2016-10-26 11:00:57.570000: USEREVENT 2 Initiaer Woodle + # BoardCount = 1;	
1: 2010-10-20 11:00:39: 101000: USELEVENT 2: Start ber u "House # Dotal Count = 1; 1: 2010-10-20 11:01:10 242000: USELEVENT 2: a addates/acaProfile## 3[SDrofile="DEDT pay AlloctPart ifc.yml" 3[SC:bDrofile="DattInd"	torfaceConfie"
1 · 2018-10-20 11:01:19.273000 · USELVENT 2 "addet later later "Drafiellame" = DEXT.pex.Alloc.tet.int.Alloc.tet.int.Still / 03300710110 = Fortant	Config":
1::2018-10-26 11:01:19.401000: [JesrFvent 2] addFFTProfile # "FondleName"="BFFT pex_AllPortBert bert vml"]ISSUProfile = "PortITS	Config":
1::2018-10-26 11:01:19:468000 : UserEvent 2 "ApplyConfiguration" # "PortIndex"=1:	, sing f
1 :: 2018-10-26 11:01: 19,524000 : UserEvent 2 "LoadInterfaceProfile" # "USProfile" = "BERT.pex.AllPortBert.ifc.xml". "USSubProfile" = "Port2Int	terfaceConfio":
1 :: 2018-10-26 11:01: 19.580000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="BERT.pex.AllPortBert.bert.xml"."USSubProfile"="Port2R:	«Config";
1:: 2018-10-26 11:01:19.671000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="BERT.pex.AllPortBert.bert.xml", "USSubProfile"="Port27>	(Config";
1 :: 2018-10-26 11:01:19.727000 : UserEvent 2 "ApplyConfiguration"# "PortIndex"=2;	2.
1:: 2018-10-26 11:01:19.782000 : UserEvent 2 "LoadInterfaceProfile"# "USProfile"="BERT.pex.AllPortBert.ifc.xml", "USSubProfile"="Port3Int	terfaceConfig";
1:: 2018-10-26 11:01:19.838000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="BERT.pex.AllPortBert.bert.xml", "USSubProfile"="Port3R;	xConfig";
1:: 2018-10-26 11:01:19.940000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="BERT.pex.AllPortBert.bert.xml", "USSubProfile"="Port3Tx	(Config";
1 :: 2018-10-26 11:01:20.007000 : UserEvent 2 "ApplyConfiguration"# "PortIndex"=3;	
1:: 2018-10-26 11:01:20.063000 : UserEvent 2 "LoadInterfaceProfile" # "USProfile" = "BERT.pex.AllPortBert.ifc.xml", "USSubProfile" = "Port4Int	terfaceConfig";
1:: 2018-10-26 11:01:20.119000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="BERT.pex.AllPortBert.bert.xml", "USSubProfile"="Port4R»	«Config";
1:: 2018-10-26 11:01:20.219000 : UserEvent 2 "LoadBERTProfile"# "ProfileName"="BERT.pex.AllPortBert.bert.xml", "USSubProfile"="Port4Tx	(Config";
1 :: 2018-10-26 11:01:20.286000 : UserEvent 2 "ApplyConfiguration"# "PortIndex"=4;	
1 :: 2018-10-26 11:01:20.363000 : UserEvent 2 "StartRxBert" # "PortIndex"=1;	
1 :: 2018-10-26 11:01:20.420000 : UserEvent 2 "StartRxBert" # "PortIndex"=2;	
1:: 2018-10-26 11:01:20.477000 : UserEvent 2 "StartRxBert" " PortIndex"=3;	
1:: 2018-10-26 11:01:20.534000 : UserEvent 2 StartRxBert # PortIndex =4;	
1:: 2018-10-26 11:01:20.591000: UserEvent 2 Start1xBER("# PortIndex"=1;	
1:: 2018-10-26 11:01:20.500000: USERCVENT 2 STARTUBERT # PORTINGEX =2;	
1:: 2010-10-20 11:01:20.710000 : USELVENT 2 StartTyPEDT** "DortIndex"=3;	
12016/10/20 11.01/20.7/0000 . USELVENT 2 Start ADDAT # "Dot Index" = 1	
1.: 2018-10-26 11:01:21.079000 · User Vent 2 General Stats + "0 unides"=4	
1::2018-10-26 11:01:21.269000 : IlserEvent 2 "GetRxPortStatistics" # "GertIndex"=4:	
1::2018-10-26 11:01:22.665000 ; UserEvent 2 "GetBertStats"# "PortIndex"=1:	
1 :: 2018-10-26 11:01:22.932000 : UserEvent 2 "GetTxPortStatistics" # "PortIndex"=4:	
1 :: 2018-10-26 11:01:23,232000 : UserEvent 2 "GetRxPortStatistics" # "PortIndex"=4;	
1:: 2018-10-26 11:01:24.639000 : UserEvent 2 "StopTxBERT"# "PortIndex"=1;	
1 :: 2018-10-26 11:01:24.697000 : UserEvent 2 "StopTxBERT"# "PortIndex"=2;	
1 :: 2018-10-26 11:01:24.755000 : UserEvent 2 "StopTxBERT"# "PortIndex"=3;	
1 :: 2018-10-26 11:01:24.811000 : UserEvent 2 "StopTxBERT"# "PortIndex"=4;	
1 :: 2018-10-26 11:01:25.868000 : UserEvent 2 "StopRxBERT"# "PortIndex"=1;	
1 :: 2018-10-26 11:01:27.037000 : UserEvent 2 "StopRxBERT"# "PortIndex"=2;	
1 :: 2018-10-26 11:01:28.183000 : UserEvent 2 "StopRxBERT" # "PortIndex"=3;	
1 :: 2018-10-26 11:01:29.329000 : UserEvent 2 "StopRxBERT"# "PortIndex"=4;	
1 :: 2018-10-26 11:01:31.682000 : UserEvent 2 "GetTxPortStatistics"# "PortIndex"=1:	



Thank You

