

Test Data Link Layer, MPLS Layer, Network Layer, & Transport Layer

Generates Full Duplex IP, UDP, VLAN, MPLS or Ethernet Traffic

Throughputs Up to 800 Mbps On-demand Bandwidth

Generate and Receive Various Patterns – QRSS, PRBS: 2⁶-1, 2⁹-1, and so on

Ethernet, MPLS, IP & UDP Level BER Testing w/ User-defined Patterns

HDL File Playback

Generate Various per Stream Impairments

User-defined Test Patterns – up to 24 bytes Length

Traffic Generation Burst & IFG Modes

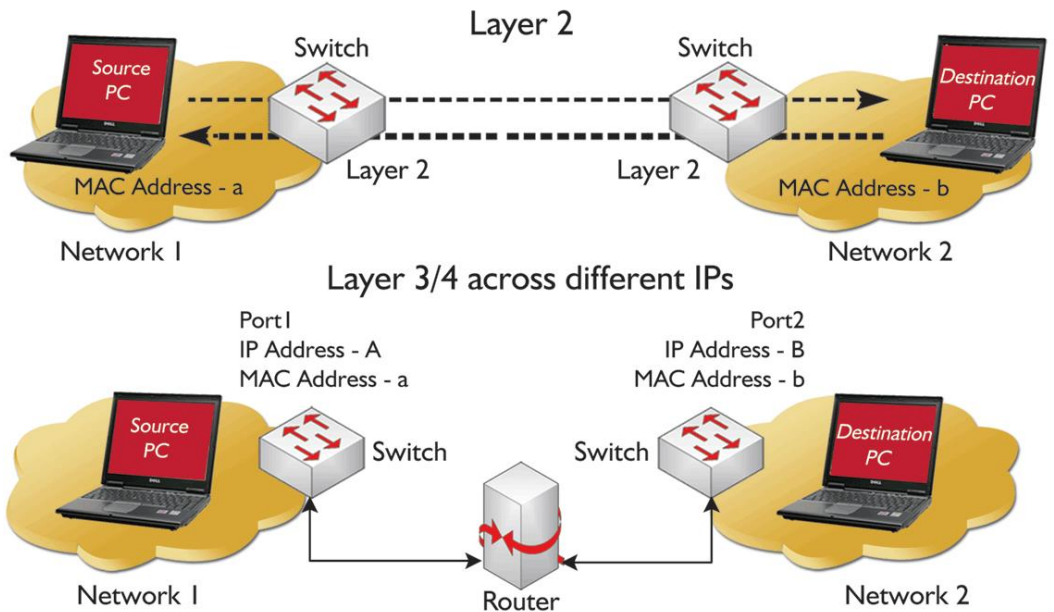
Tx/Rx Frame Statistics for each Stream and Common Statistics for all Streams

End-to-End Performance Statistics w/ RTD & OWD Measurement

Command Line Interface

Report Generation PDF, XML Formats

PacketCheck™ - Software Ethernet Tester



Overview

GL's PacketCheck™ is a complete PC based Ethernet / IP test tool that provides multi stream capabilities with BERT, Throughput, Delay, and Impairment testing features with on-demand bandwidth (up to 800 Mbps). It is very easy to use as a general purpose network performance analysis tool for 10Mbps, 100Mbps and 1Gbps LANs and WANs. Throughput up to 800 Mbps can be easily tested.

The application truly takes confusion out of Ethernet testing at all protocol layers - from raw Ethernet frames to Stacked VLAN, Stacked MPLS, & IP/UDP packets. PacketCheck™ makes use of PC's network interface card (NIC) to transmit and receive Ethernet or IP packets over the network.

The application measures end-to-end performance such as Bit Error Rate, Bit Error Count, Total Packets, Packet loss, Out-of-Sequence Packets, and Errored Packets. Additional features include transmission of pre-recorded file traffic, traffic generation with IFG (Inter Frame Gap) of up to 5 msec accuracy, delay measurements, impairment generation, and BER testing capability with provision to generate PRBS patterns or user-defined test patterns.

It also includes a Command Line Interface (CLI) to support all the GUI functionalities of PacketCheck™ through simple commands, allowing easy scripting and automation of the testing. Also included is a powerful Report Generation feature to view report in XML and PDF formats.

File Playback feature within PacketCheck™ is used for GTP traffic simulation over Wireless networks, where the packet data can be carried as pre-recorded traffic files (GL's proprietary Ethernet traffic capture format *.HDL files) to destination nodes.

For detailed information on PacketCheck™, refer to <http://www.gl.com/packetcheck.html>.



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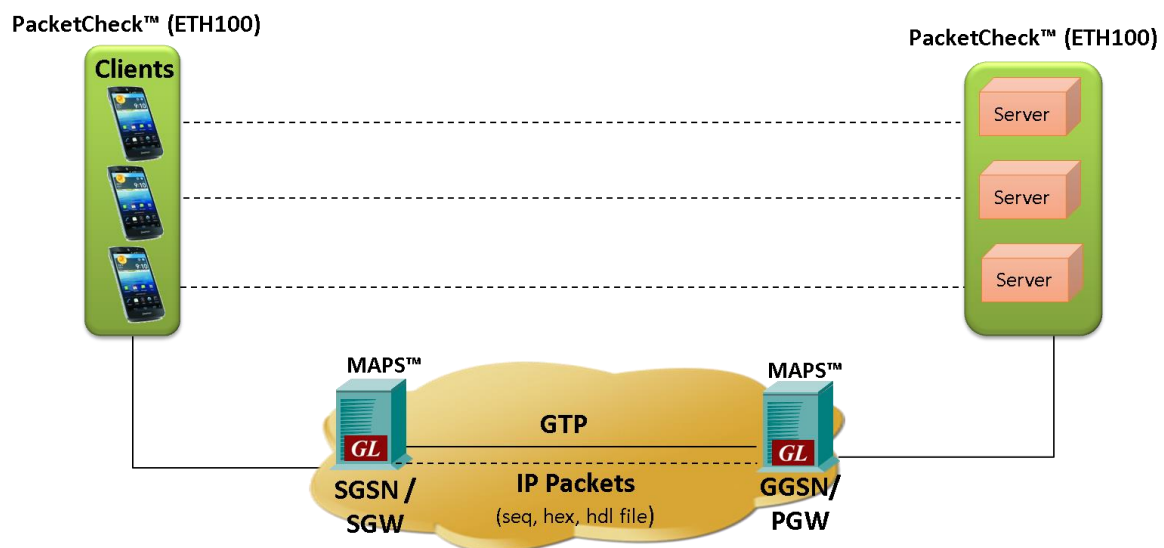
Features

- Generate/receive Ethernet or IP traffic of up to 800 Mbps bandwidth. Supports minimum line rate of 64bps.
- Generates full-duplex IP, UDP, or Ethernet traffic to tx and/or rx traffic on any layer (Layer1, Data Link with stacked VLAN/ MPLS, Network, Transport) with on-demand bandwidth.
- Supports stacked VLAN (upto 3 stacks) with customizable Type Field, VLAN ID, & Priority.
- Supports customizable stacked MPLS (upto 3 stacks) with Label, CoS, & TTL fields.
- Customizable protocol headers like MAC Source/Destination address, Length/Type field, IP Source/Destination address, and UDP Source/Destination Port.
- Multi-stream traffic generation with independent configuration & measurements for each stream.
- Monitors performance statistics – throughput, round trip delay (RTD), one way delay (OWD), total packets, packet loss, out of sequence frames, error frames, correct pattern frames
- **BER Testing**— Bit Error Rate, Sync Loss Count, Bit Error Count, PRBS Pattern Generation/Verification of various patterns like QRSS, 2^6-1 , 2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, and $2^{23}-1$.
- Run-time impairments generation of various types including Insert/Delete Bytes, and Byte Level Impairments (AND, OR, XOR).
- Jumbo frames are supported, in addition to all normal frame sizes between Min and Max Frame Length (64 bytes to 1518 bytes).
- Stream-wise statistics and common statistics for all the streams are displayed.
- GTP traffic simulation playing back pre-recorded files (GL's proprietary *.HDL files) carrying packet data
- Command Line Interface (CLI) allowing remote execution of commands for all functionalities.
- Powerful Report Generation feature to generate reports in XML / PDF formats.

GTP Traffic Simulation

Using the File Playback feature within PacketCheck™, the packet data can be carried as pre-recorded traffic files (GL's proprietary Ethernet traffic capture format *.HDL files) to destination points and the same can be verified at the receiving end, which can also be a PacketCheck™. This feature can be used GL's Mobile IP Core traffic module (requires Additional Licenses) to simulate GTP traffic over UMTS or LTE network.

Generally, in an EPC network, are two types of data pipes can be found - Default Bearer (with non-guaranteed QOS) and Dedicated Bearer (with assured guaranteed QOS). The PacketCheck™ can be used with GL's MAPS™ UMTS / LTE Simulators to encapsulate the generated packet data within GTP headers when transmitting through the gateways such as SGSN & GGSN, or SGW & PGW to verify the bearer allocation bandwidth at the end points. The packet data traffic generated at one end is received at the other end can be verified with various statistics such as packet loss, lost frames, bit error count, Tx Rx frames count and other traffic parameters.



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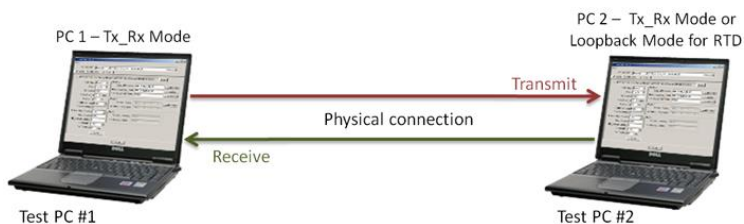
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Ethernet BER Testing At Layer 1

The physical layer abbreviated as “PHY” is the only layer over OSI model where data is physically moved across the network interface.

PacketCheck™ can be configured to Layer 1 BER testing automatically by setting other layers to None.

Two PCs are connected using Ethernet cable for Layer 1 testing: PacketCheck™ configuration for Layer1 BER Testing is as depicted below, can test the basic packet flow over the physical connection.



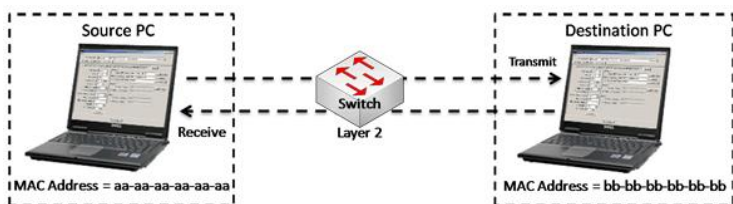
At Layer 2

The bridges, switches, and network interface cards (NIC) work at Layer 2 (Data Link) and handle physical addressing, packing data into frames, and sequencing data frames. The Layer 2 consists of Logical Link Control (LLC) and Media Access Control (MAC) sub-layers, which route the packets based on the MAC address. So, only the MAC addresses need to be configured for layer 2 testing.

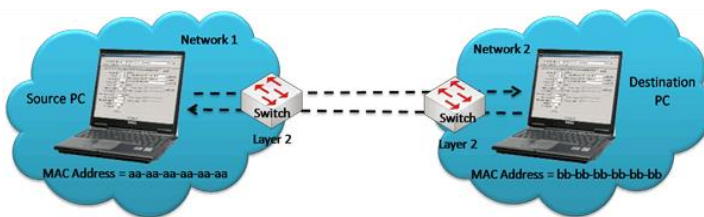
This test is performed in order to:

- Test the capability of the switch to handle the MAC frames at various bandwidths
- Test the forwarding capacity of the switch (based on the MAC addresses)
- Measure the ability of the switch to deliver the frames in sequence
- Verify incoming data by analyzing bit patterns of the received frames

Scenario 1 - Source & Destination PC in the same LAN, connected through a single switch.

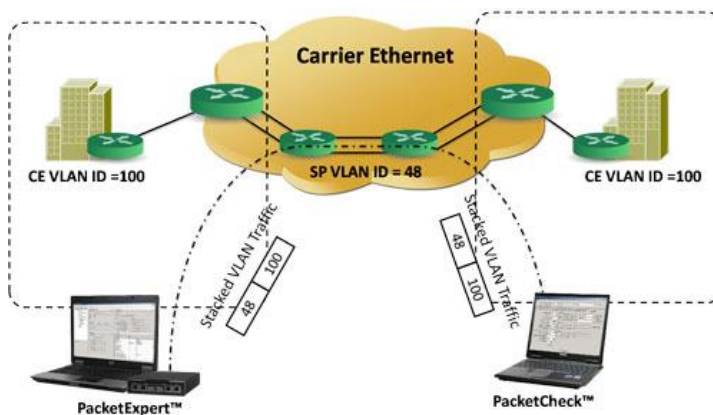


Scenario 2 - Source & Destination PC located at different LANs connected through multiple switches.



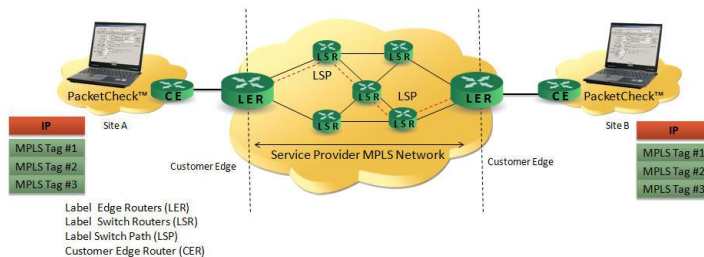
Layer 2 Ethernet Testing with Stacked VLAN

Stacked VLAN ID feature can be used to simulate the Carrier Ethernet condition shown in the figure, where SP VLAN ID is stacked on top of CE VLAN ID.



Layer 2.5 Stacked MPLS Testing

Stacked MPLS (upto 3 levels) is supported. Various combinations tests such as single MPLS, multiple MPLS, VLAN + MPLS can be tested for both single and multiple streams.



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Ethernet BER Testing...

At Layer 3

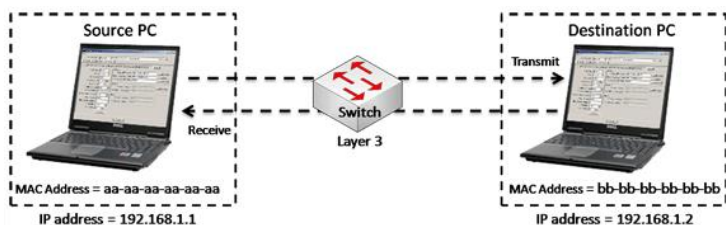
PacketCheck™ supports BER testing at Layer 3 as well as at Layer 4.

The Network Layer (Layer 3) uses routing technologies to connect various systems within a network or to connect multiple networks together through Gateways.

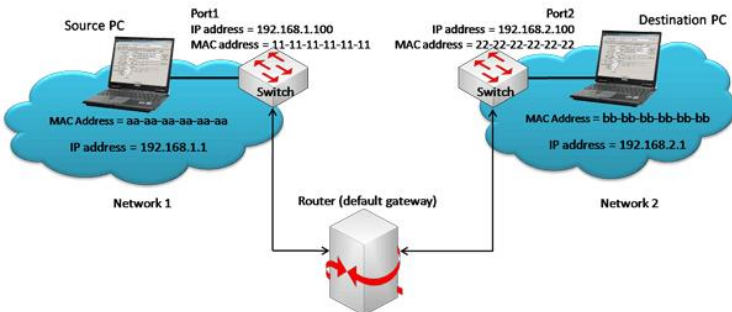
In Layer 3 testing, packets are routed between the Source and Destination PCs based on both the IP address and MAC address. So, both the MAC address and the IP address have to be configured for Layer 3 testing.

Since IP networks encompass various types of physical networks consisting of LAN and WAN links, there is lot of scope for packet modification, packet loss, and out of order packets. GL's PacketCheck™ helps measure these metrics of the IP network.

Scenario 1 - Source & Destination PC are located within the same IP network, and hence are directly reachable.



Scenario 2 - Source & Destination PC are located at different IP networks, and are connected through routers.



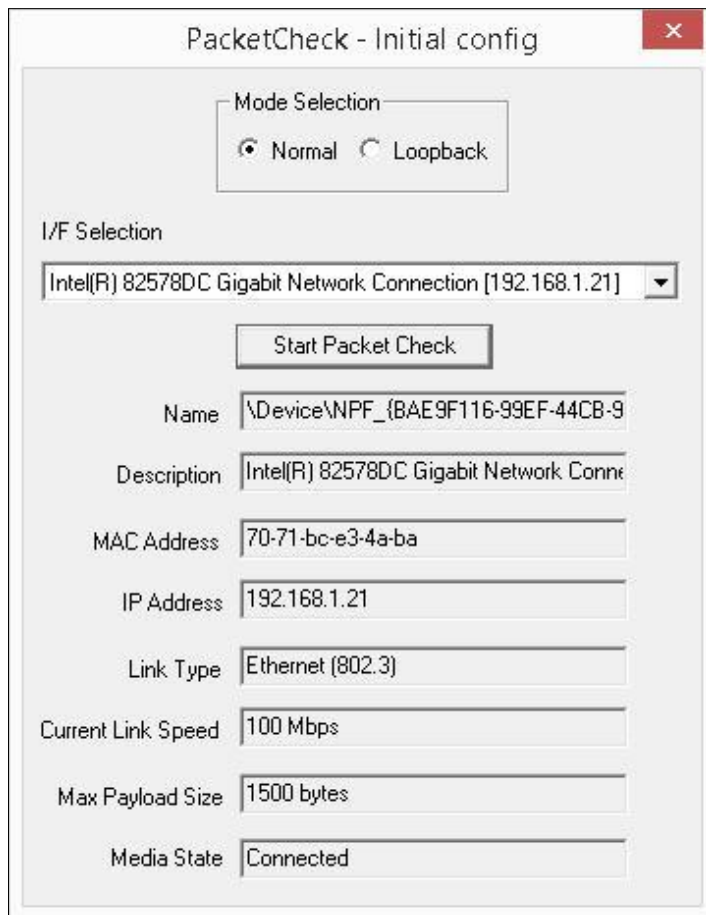
At Layer 4

The Transport Layer (Layer 4) provides end-to-end, error-free reliable data transfer. TCP and UDP are the most common Layer 4 protocols. For Layer 4 testing, source and destination UDP ports need to be configured in addition to MAC and IP addresses.

Interface Selection and Details

The MAC address and IP address of the available network cards in a PC are automatically displayed using I/F (Interface) selection option in the GUI.

In **“Normal”** mode, application can be configured to perform “Tx” | “Rx” | “Tx and Rx” on multiple streams. In **“Loopback”** mode the packets (layer2/3/4) received from a device (DUT) are transmitted back to the same device without any modifications of the pattern.



Traffic Generation Modes

PacketCheck™ can transmit data in 2 modes – **Burst Mode** and **IFG (Inter Frame Gap) Mode**.

In Burst mode, traffic is generated in bursts, while maintaining the user defined bandwidth.

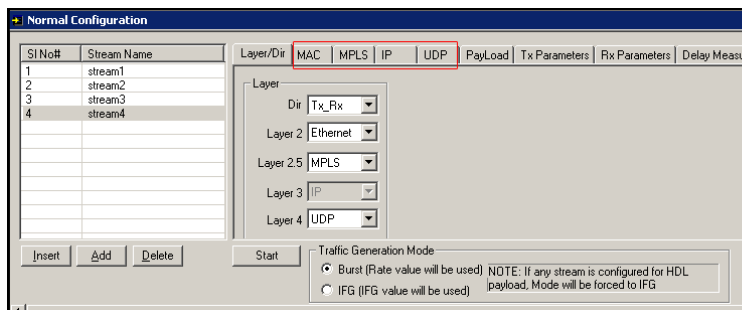
In IFG mode, traffic is generated constantly, while maintaining the user defined Inter Frame Gap. Improved IFG supports up to 5 msec accuracy on high end systems.



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Parameter Configuration

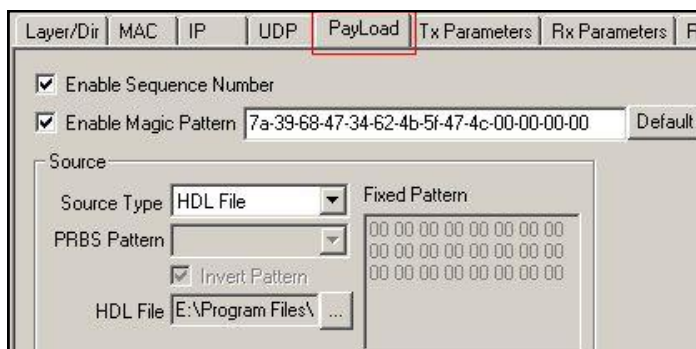
PacketCheck™ generates full duplex multi stream traffic on any of the four layers with on demand bandwidth. Some key parameters include – Layer/Direction selection, Layer 2 MAC with Stacked VLAN settings, Layer 2.5 Stacked MPLS settings, Layer 3 IP settings, Layer 4 UDP settings, Stream Payload, Tx & Rx Parameter Settings, RTD & OWD (µsecs), and various impairments settings.



Payload

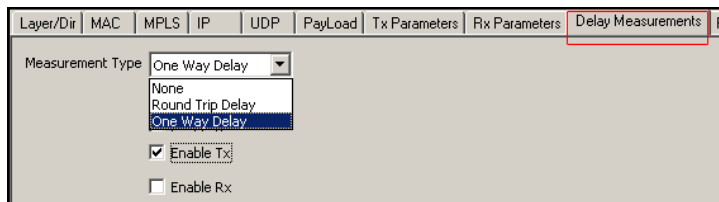
Users can choose to insert various types of payload into the stream like PRBS patterns (through pre-defined files), and user-defined fixed patterns of up to 24 bytes, HDL File. Transmission of pre-captured HDL file (GL's proprietary file) allows simulation of real-world traffic (such as IPTV, RTP,...).

Option is provided to insert Sequence number to the payload to identify Lost/Out-of-order packets and to insert Magic pattern to uniquely identify test packets.



Delay Measurements

PacketCheck™ can be configured to measure **One-Way Delay (OWD)** within the same PC, calculating the delay at the receiving end in µsec. Also, measures the average **Round Trip Delay (RTD)** value of each packet in µsec.



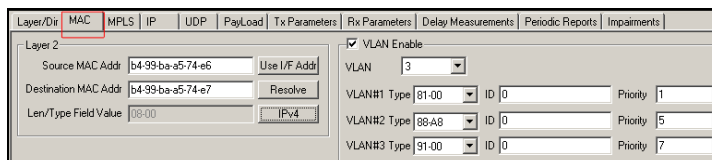
Layer Configuration

MAC, Stacked VLAN, IP, MPLS, UDP Parameters

• [Layer 2] - Ethernet

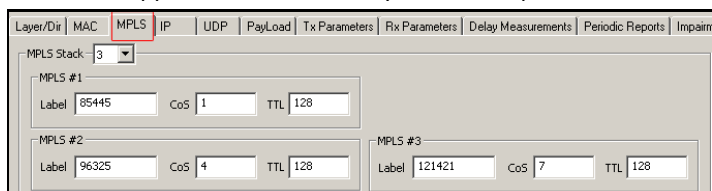
Configure with source and destination MAC Addresses (6 byte hex format). The source address can be automatically fetched from the PacketCheck™ application, while the destination MAC address can be obtained using 'Resolve IP to MAC' feature. In addition, user can specify the Length/Type field value.

Stacked VLAN - option to enable or disable VLAN. If enabled, can select from 1 to 3 levels, numbered VLAN #1, VLAN #2 and VLAN #3. For each VLAN tag, user can specify the VLAN Type Field (user can only select from fixed values, as this field has only few fixed values), specify the VLAN Id and Priority.



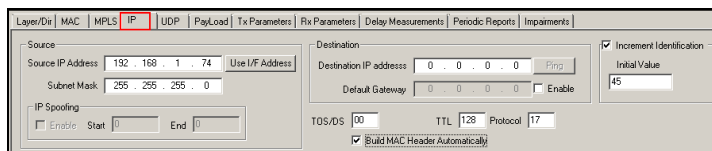
• [Layer2.5] - MPLS

Configure Layer 2.5 - MPLS parameters upto 3 stacks with MPLS headers Label, CoS, and TTL. If MPLS layer is enabled for the testing, IP is enabled by default. This is because PacketCheck™ does not support MPLS/None, only MPLS/IP is possible.



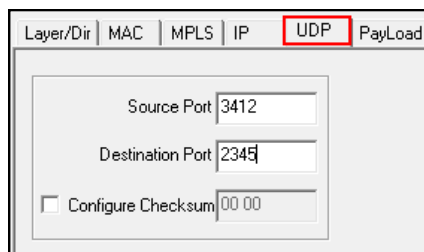
• [Layer 3] - IP

Users can define source and destination IP addresses, configure various IP header fields like TOS field, TTL field and protocol fields. "Build MAC Header Automatically" option helps user to easily obtain MAC addresses while performing Layer3/Layer4 testing. Increment Identification option automatically increments the IP header Identification values for subsequent packets.



• [Layer 4] - UDP

Requires source and destination UDP ports to be defined for Layer 4 testing, which can also be changed as per the user's requirements.

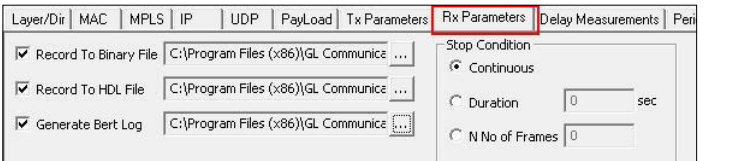
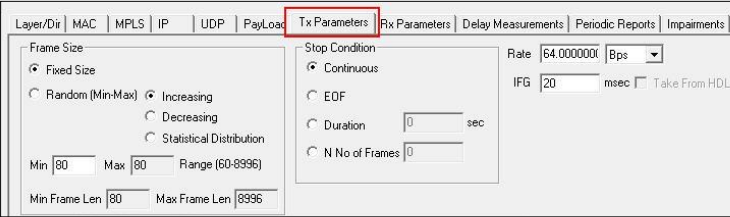


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Tx Rx Parameters Settings

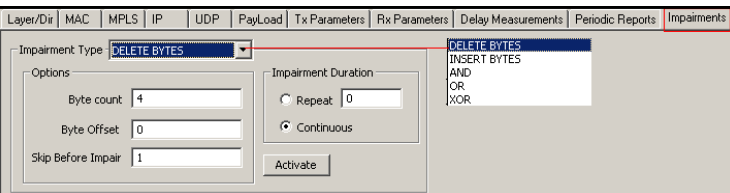
Tx Parameter settings are applicable to Tx or Tx Rx modes. Used to configure Frame size, Bandwidth, Inter Frame Gap (IFG), and transmission stop condition parameters, frame size of fixed/random length, and with transmission rate ranging from 64bps to 800Mbps.

Rx Parameter settings allow creation of log files for each stream. The received frame details can be logged into a binary (*.bin), HDL, and also BERT files.



Impairments

Introduce impairments into the outgoing traffic using various impairment types and duration. Supports various types of impairments – DELETE BYTES, INSERT BYTES, AND, OR, & XOR. Impairments can be introduced at specific intervals or can be set to continuous insertion on each stream.



Tx & Rx Statistics and Results

Once the test is started, users can view stream-wise statistics and common statistics for all the streams. Parameters displayed includes StreamID, Stream Name, Mode, Duration, Tx/Rx Frames, Tx/Rx Rate, Lost Frames, Out-Of-Order Frames, Pattern Error Frames, Good Frames, Non-test Frames Received, Bit Error Rate, Error Status, Sync Loss Count, Bit Error Count, RTD, OWD, UDP Checksum Statistics, and Zero Checksum UDP Packet. Common Statistics helps to monitor any extra traffic being received on the NIC. Hence, the emphasis is more on Rx parameters.

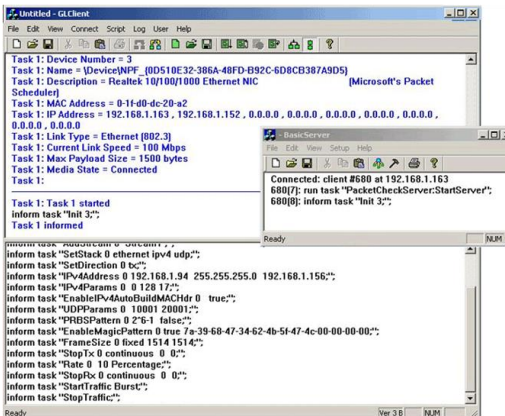
Statistic	1	2	3	4	5	6	7	8	9	10	Common Statistic	Values
StreamID	1	2	3	4	5	6	7	8	9	10	Tx Frames	2141042
Stream Name	1	2	3	4	5	6	7	8	9	10	Tx Rate	95.97 Mbps
Mode	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Tx_Rx	Rx Frames	6034822
Duration	00:14:02	00:14:02	00:14:02	00:14:02	00:14:02	00:14:02	00:14:02	00:14:02	00:14:02	00:14:02	Rx Rate	95.57 Mbps
Tx Frames	696484	1393900	842169	543126	438861	1407544	877463	696484	696484	696484	Rx Non-Test Frames	89
Tx Rate	10.00 Mbps	9.00 Mbps	9.00 Mbps	7.00 Mbps	6.00 Mbps	16.00 Mbps	10.00 Mbps	10.00 Mbps	10.00 Mbps	10.00 Mbps	Rx Broadcast Frames	300
Rx Frames	696487	1393900	842169	543126	438861	1407544	877463	696487	696487	696487	Rx Unicast Frames	21414094
Rx Rate	10.00 Mbps	9.00 Mbps	9.00 Mbps	7.00 Mbps	6.00 Mbps	16.00 Mbps	9.99 Mbps	10.00 Mbps	10.00 Mbps	10.00 Mbps	Rx IP Frames	21411114
Lost Frames	0	0	0	0	0	0	0	0	0	0	Rx UDP Frames	21411114
Out-Of-Order Frames	0	0	0	0	0	0	0	0	0	0	Rx ARP Frames	886
Pattern Error Frames	0	0	0	0	0	0	0	0	0	0	Rx ICMP Frames	0
Good Frames	0	0	0	0	0	0	0	0	0	0	Rx 64 Length Frames	0
Non-Test Frames Received	0	0	0	0	0	0	0	0	0	0	Rx 65-127 Length Frames	14116561
Bit Error Rate	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	Rx 128-511 Length Frames	30
Error Status	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	SYNC	Rx 512-1023 Length Frames	1306238
SyncLoss Count	0	0	0	0	0	0	0	0	0	0	Rx 1024-1518 Length Frames	6715210
Bit Error Count	0	0	0	0	0	0	0	0	0	0		
RTD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
OWD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
UDP Checksum Error Frames	0	1393903	842169	543120	0	0	877463	696476	696477	0		
Zero UDP Checksum Packet	696479	0	0	0	0	0	0	0	0	696474		

Command Line Interface (CLI)

PacketCheck™ Command Line Interface (CLI) that supports all the functionalities of PacketCheck™ can be accessed via Commands, instead of the GUI. The CLI can be accessed through GL's proprietary WCS (Windows Client Server) architecture, thereby allowing remote execution of commands.

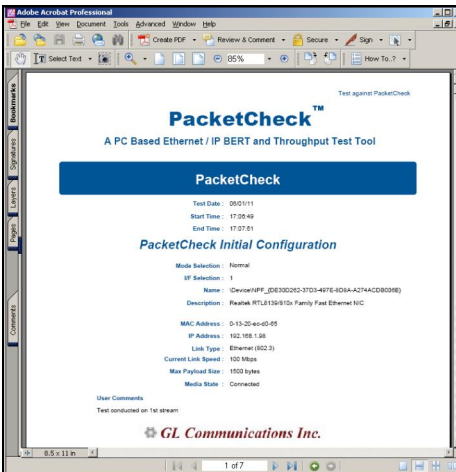
Sample Script:

```
run task "PacketCheckServer:StartServer";
inform task "Init 2;";
inform task "Runscript 0 'Scripts\Layer2_Test.txt' 0.0.0.0;";
inform task "Statistics 0;";
inform task "StopTraffic;";
inform task "GenerateReport pdf 'TestRpt' 'Good Test' 'www.gl.com' 'Copyright' 'GL_Logo.JPG' 's1';";
```



Report Generation

PacketCheck™ has the capability to generate report at the end of every test and also includes feature to generate periodic reports during the test. Report can be generated in PDF, and XML format with customizable headers and footers, and an option to include test comments with custom logo in the report.



Buyer's Guide

- ETH100** – PacketCheck™
 - ETH200** – Two PacketCheck™ applications
- For complete list of related software, refer to <http://www.gl.com/packetcheck.html>



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