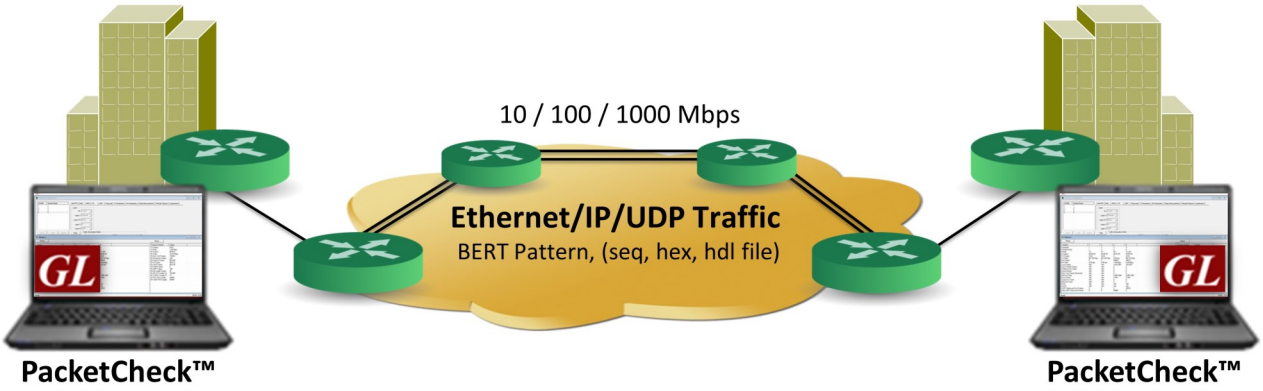
PacketCheck™ - Software Ethernet Tester



Overview

GL's PacketCheck™ is a complete PC based Ethernet / IP test tool that provides multi stream capabilities with BERT, Throughput and Delay, and Impairment testing features with on-demand bandwidth (up to 500 Mbps). It is very easy to use as a general purpose network performance analysis tool for 10 Mbps, 100 Mbps and 1 Gbps LANs and WANs. Throughput up to 500 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, and 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, Errored Packets, Round Trip Delay, and One Way Delay (within the same PC). Additional features include transmission of pre-recorded file traffic, recording per stream traffic to file, GTP traffic simulation, traffic generation with IFG (Inter Frame Gap) of up to 5 msec accuracy, impairment generation, and BER testing capability with provision to generate PRBS patterns or user-defined test patterns. Supports recording of the user defined stream traffic to a PCAP (PCAPNG/NTAR) or HDL (GL Proprietary) file format and playback the pre-recorded traffic from a PCAP (PCAPNG/NTAR) or HDL (GL Proprietary) file format.

For more information, refer to PacketCheck™ - Software Ethernet/IP Tester webpage.

Main Features

- Capability to test Ethernet traffic of up to 500 Mbps bandwidth. Supports minimum line rate of 64 Bps
- Generate/receive Ethernet or IP traffic of up to 500 Mbps bandwidth
- Supports minimum line rate of 64bps (bits per second)
- Generate full duplex traffic at any of the four layers (Layer1, Layer2 (Ethernet) with stacked VLAN/ MPLS, Layer3 (IPv4), Layer4 (UDP)) with on-demand bandwidth
- Capture stream traffic in PCAP (PCAPNG/NTAR) or HDL file format
- Playback pre-recorded traffic from PCAP (PCAPNG/NTAR) or HDL file format
- Provides options to record unidentified network traffic which does not belongs to any user defined stream into a PCAP (PCAPNG/ NTAR) or HDL file format and analyze the recorded traffic in Wireshark or PacketScan™ application
- Supports stacked VLAN (up to 3 stacks) and customizable stacked MPLS (up to 3 stacks)
- Measures throughput, round trip delay, one-way delay, 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 also supported (depending on the NIC card support for Jumbo frames)
- Stream-wise statistics and common statistics for all the streams are displayed
- Powerful Report Generation feature to generate reports in XML/ PDF formats

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Main Features (*Contd.*)

- Create multiple full-duplex streams per PacketCheck™ easily
- Each stream can be configured as Transmit Only, Receive Only, or Transmit and Receive
- Ability to copy from one stream to another (both one-to-one copy and one-to-many copy) to quickly configure multiple streams
- Ability to resolve IP Address to MAC address (based on Address Resolution Protocol (ARP)) for all streams with a single click, so that all streams are configured properly before starting the test
- Populate switch/router MAC tables and routing tables using the Resolve all streams feature before the starting the test to avoid unnecessary flooding
- Independently define each stream to operate as Layer 2 (Ethernet) or Layer 3 (IP) or Layer 4 (UDP)
- For Layer 3 or Layer 4 streams, analyzes the received payload based on the IP or UDP length and ignore any MAC padded bytes added in transit
- Define the frame size/rate to be generated for each stream Independently
- Jumbo frames are supported, in addition to all normal frame sizes from 64 bytes to 1518 bytes
- Up to 500 Mbps total combined rate (all streams combined) is possible
- The transmission rate can be configured to operate in 2 modes – Burst mode or Inter Frame Gap (IFG) mode
- In Burst mode, each stream's rate can be set in Mbps, Kbps, etc.
- Burst mode tries to generate traffic with the configured rate, but also as smoothly and evenly distributed so that the Device Under Test (DUT) node buffers do not overflow due to a temporary spike in the peak traffic
- In IFG mode, the Inter Frame gap in milliseconds can be configured. The estimated rate achievable based on the IFG and the frame size is displayed for user convenience
- Use a full-featured version or a loopback only version (with address swapping) at node endpoints
- Capability to generate/respond to ARP requests, making it easy to work with Routers
- Measure One-Way Delay (OWD) or Round Trip Delay (RTD) automatically
- Provides user configurable Packet Length for OWD and RTD
- Generate reports in XML or PDF formats
- Support to configure IP Protocol Type from 0 to 255
- Multiple Instances – run multiple instances on a single PC to utilize all available NIC cards

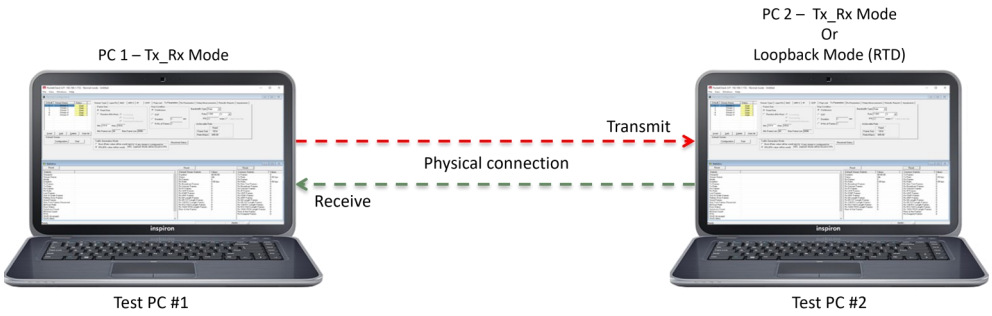
Applications

- Create multiple streams of traffic for network testing from layer 2, 3, or 4
- Bit Error Rate Testing for checking networks for dropped packets, out-of-order, non-test frames, and so on. Write packet errors to an error log
- Determine Round Trip Delay (RTD) between two IP addresses or two Ethernet MAC addresses with microsecond accuracy
- Determine One Way Delay (OWD) between two NIC cards on the test PC with microseconds accuracy
- Record test traffic in binary and/or PCAPNG or NTAR file format
- Playback PCAPNG files for test traffic generation. Either recorded from test BERT traffic or recorded traffic of interest
- Record non-test packets to a PCAPNG file. i.e. Non-BERT traffic related packets

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.



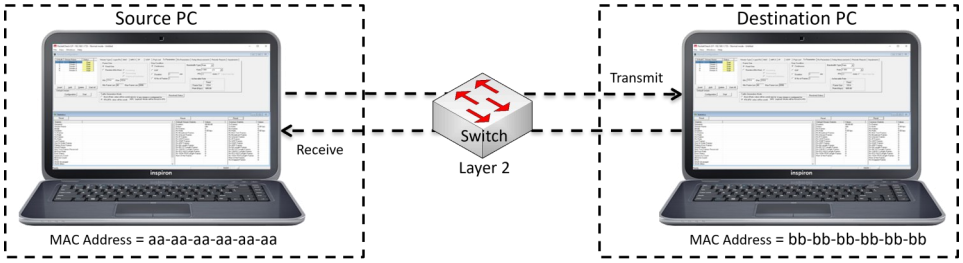
At Layer 2

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

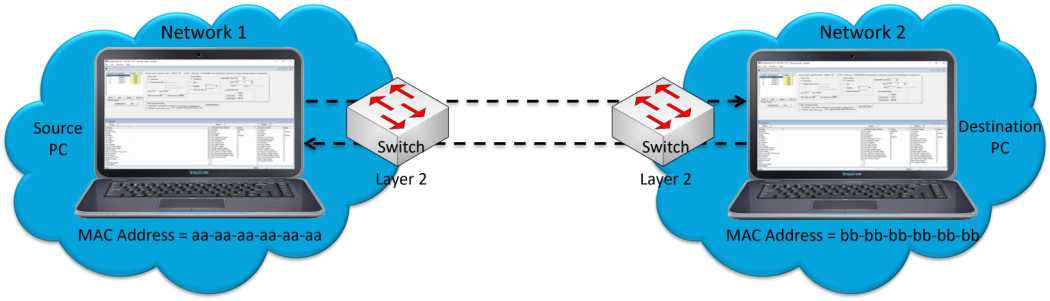
Scenario 1

Source and Destination PC in the same LAN, connected through a single switch.



Scenario 2

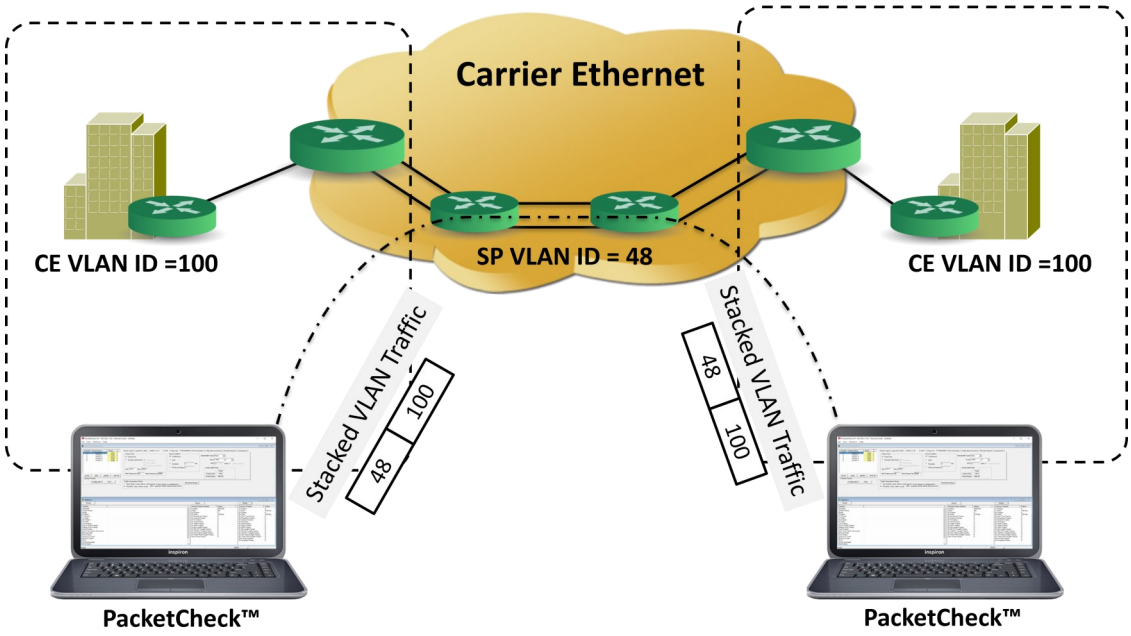
Source and Destination PC located at different LANs connected through multiple switches.



Ethernet BER Testing (Contd.)

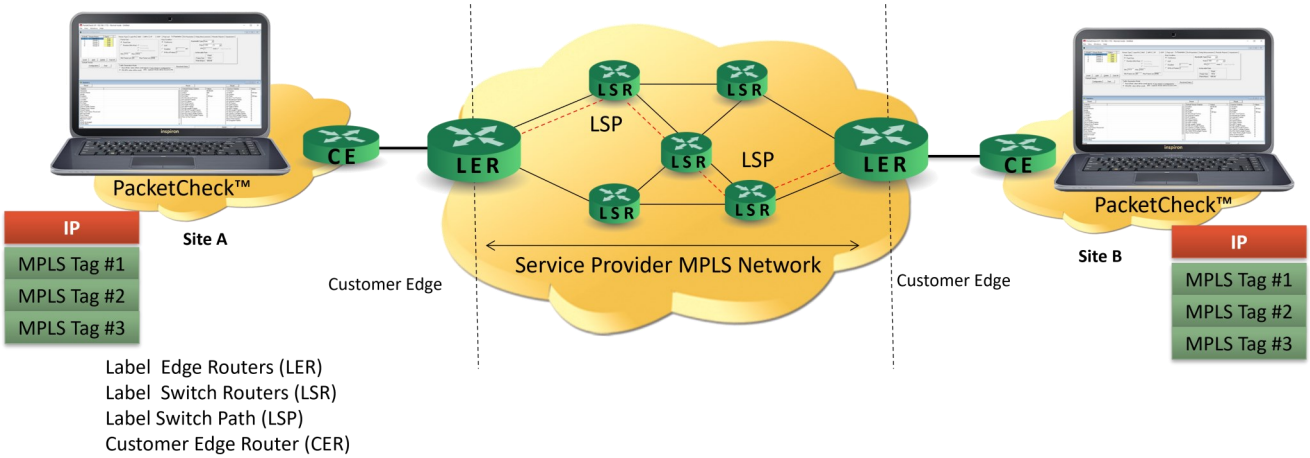
Layer 2 Ethernet Testing with Stacked VLAN

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.



Ethernet BER Testing *(Contd.)*

At Layer 3

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

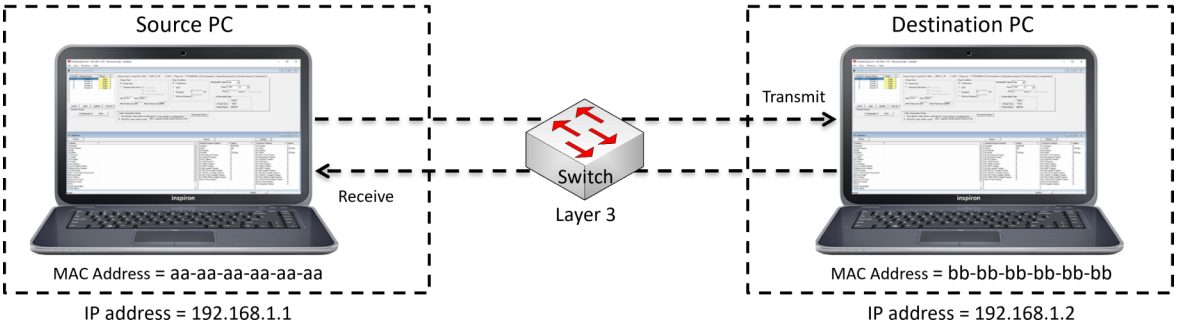
The Network Layer (Layer 3) uses routing technologies to connect various systems within a network or to connect multiple networks together through Gateways.

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.

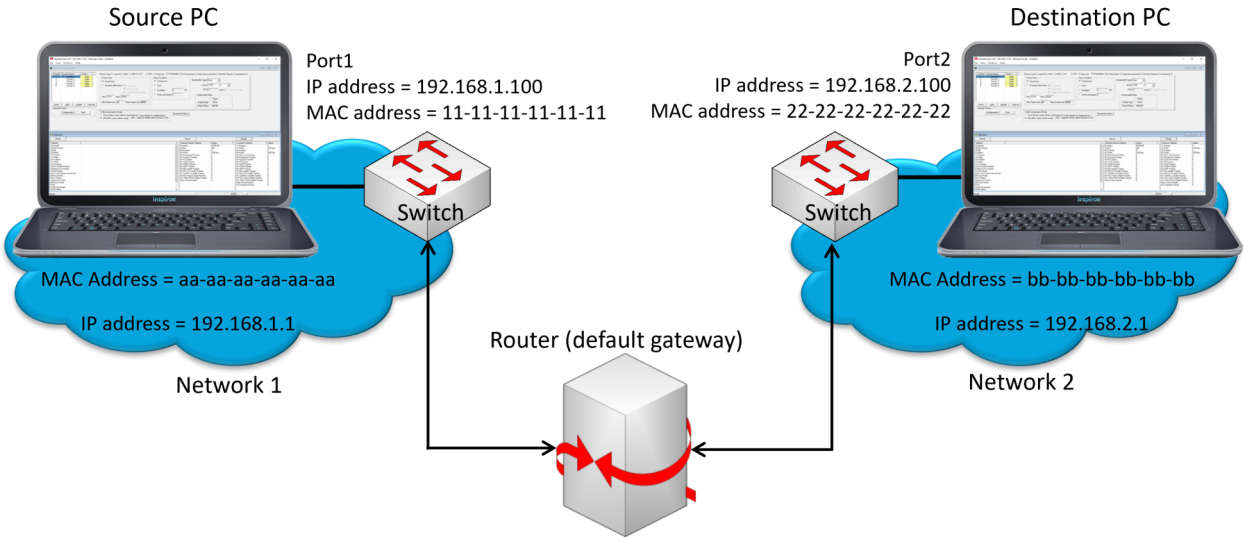
Scenario 1

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



Scenario 2

Source and 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 (layer 2/3/4) received from a device (DUT) are transmitted back to the same device without any modifications of the pattern.

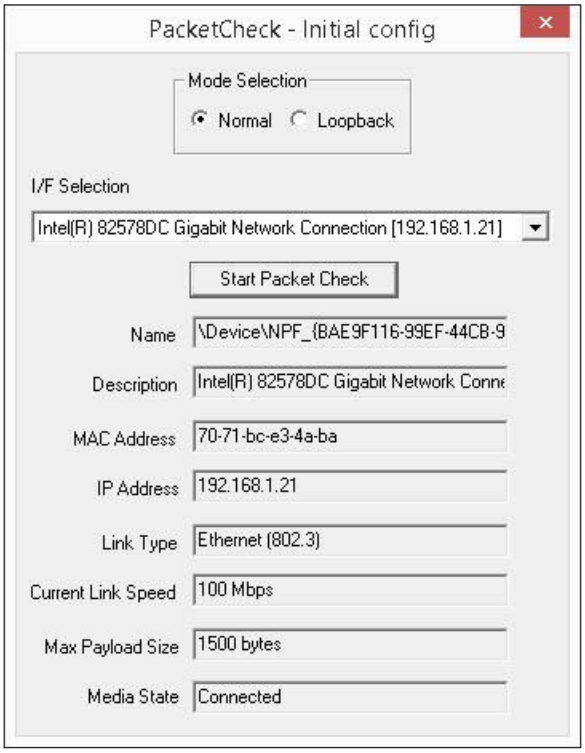


Figure: PacketCheck™ initial Config

Stream Type

This option allows to select **File Based** or **User Defined** stream types.

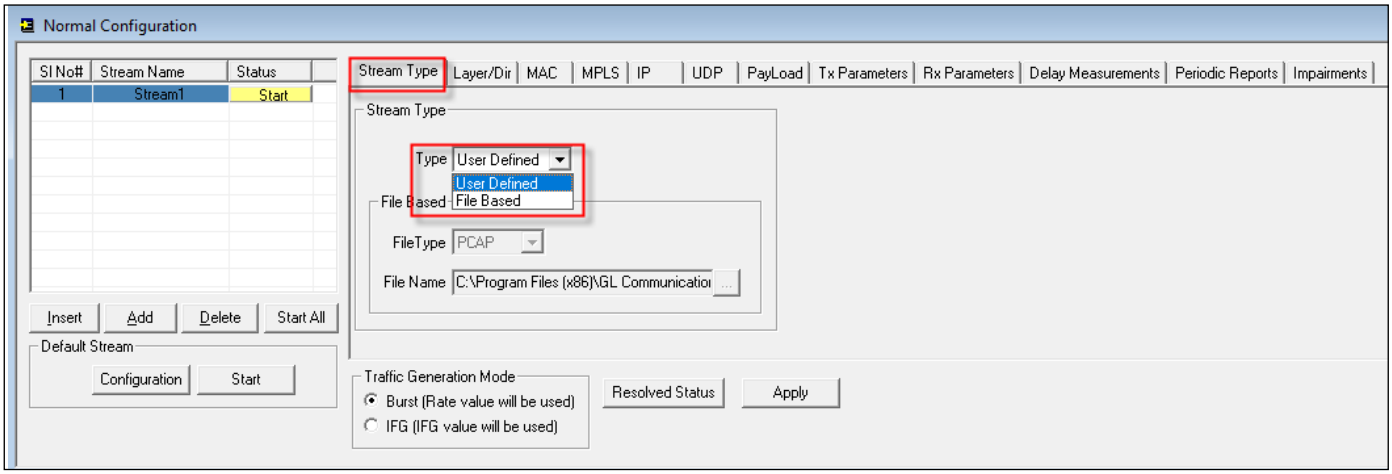


Figure: Stream Type Selection

Stream Type (Contd.)

File Based Stream Type (Tx Only)

This option allows users to specify a source file for the stream, this source file can be PCAP or HDL file format. The packets are read from the specified file and the packets are transmitted sequentially. User has option to transmit the file continuously or stop at the end of file or after N number of frames or after specified duration in seconds.

In File based option the default mode is set to Tx and all the other configurations will be disabled as it is not required in File Based option. Select the HDL or PCAP file format as recorded and choose the file name to transmit the traffic.

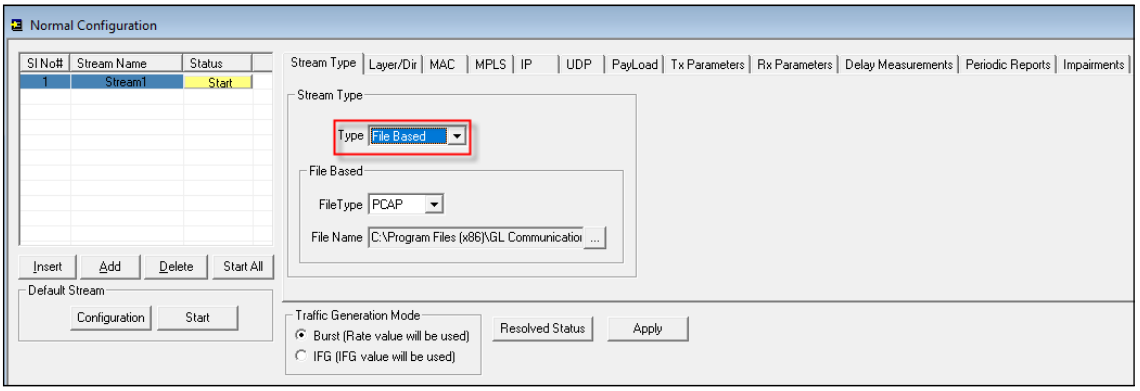


Figure: File Based Stream Type

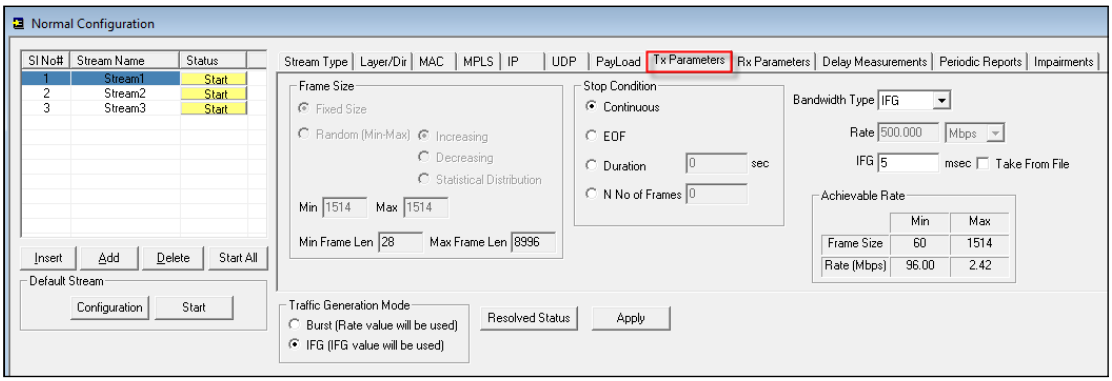


Figure: File Based Tx Configuration window

User Defined Stream Type

This option allows users to define the stream parameters such as Layer, Ethernet/IP/UDP Headers, Frame Size, Rate, Payload etc. and the PacketCheck™ generates/analyzes the stream traffic as per these parameters.

User defined option enables Tx and Rx modes configurations for conducting BER testing across different layers. These layers include Layer 1 (Framed Layer 1), Layer 2 (Framed Ethernet), Layer 2.5 (Stacked MPLS), Stacked VLAN, IP, and UDP.

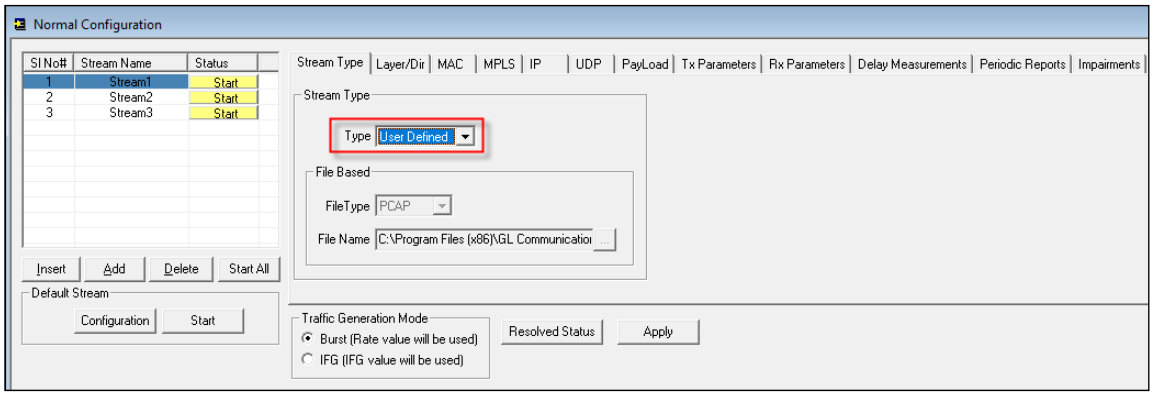


Figure: User Defined Stream Type

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.

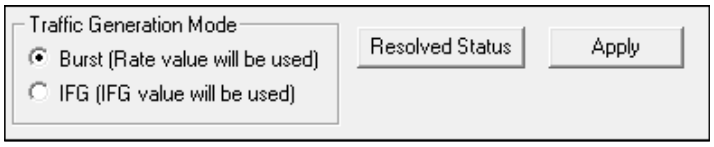


Figure: Traffic Generation Mode

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 and Rx Parameter Settings, RTD and OWD (µsecs), and various impairments settings.

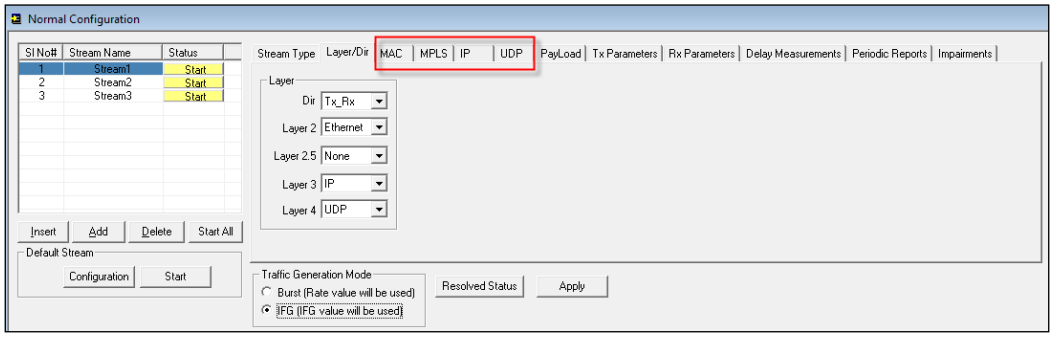


Figure: Stream 1 Configuration

Payload

Users can choose to insert two types of payload into the stream like PRBS patterns (through pre-defined files) and user-defined fixed patterns of up to 24 bytes.

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.

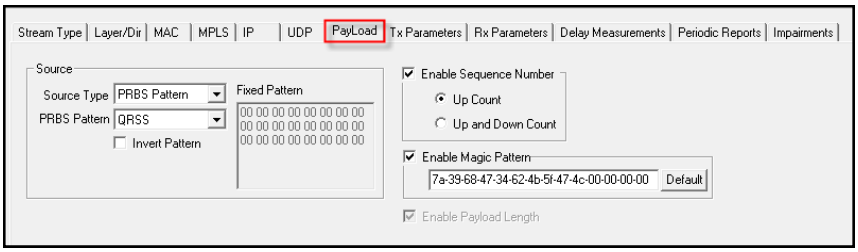


Figure: Payload Configuration

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. User can set Tx OWD Frame Length to Minimum, Maximum or Average (Ranges from 40 to 8996). Also User can define the frame length as required.

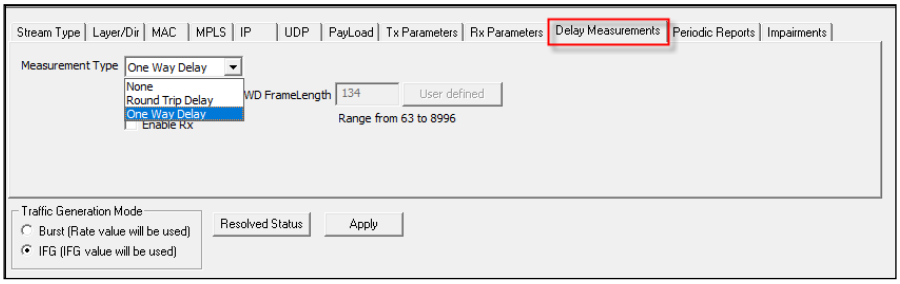


Figure: Delay Measurement Configuration

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 EtherType 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.

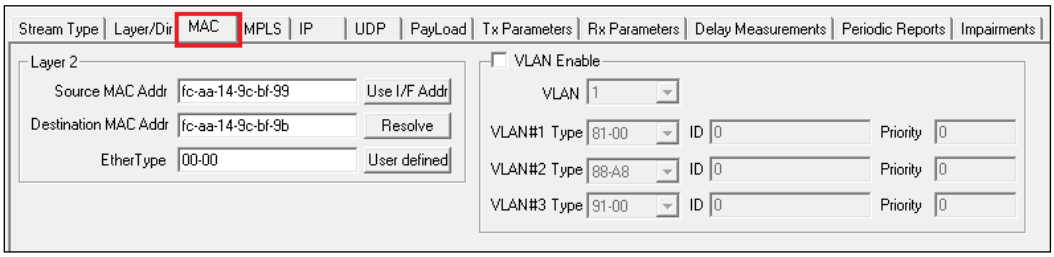


Figure: MAC Configuration

[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.

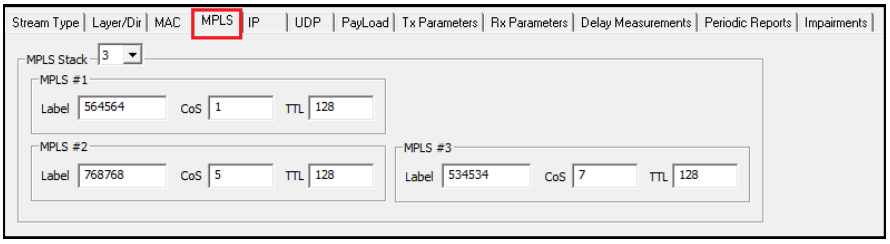


Figure: MPLS Configuration

[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 Layer 3/Layer 4 testing. If enabled, the Identification field within the IP header is incremented for every IP packet sent out.

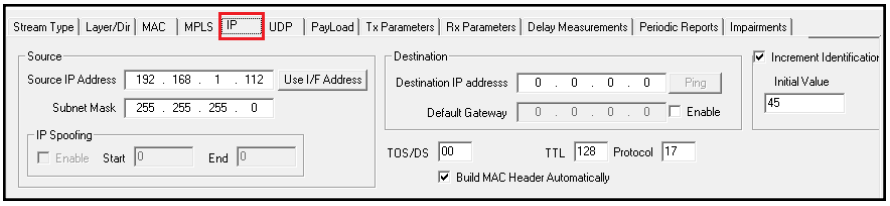


Figure: IP Configuration

[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.

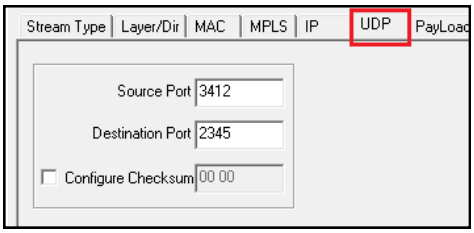


Figure: UDP Configuration

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 500Mbps.

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.

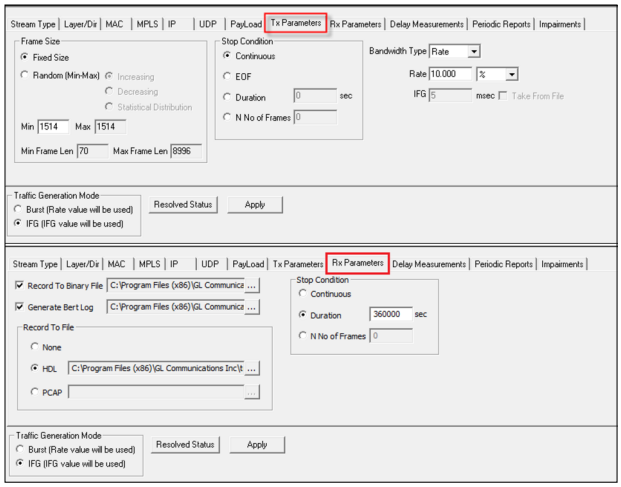


Figure: Tx and Rx Parameter Configuration

Default Stream

All incoming Ethernet frames not belonging to any of the user defined streams are treated as default stream. Statistics for the default stream are displayed, and users can start/stop the default stream at anytime. By recording the default stream traffic to a PCAP or HDL file, users can open the file in Wireshark® or PacketScan™ and quickly check the non-test traffic.

Provides options to record the traffic continuously, specified duration or with the specified number of frames in HDL or PCAP file format.

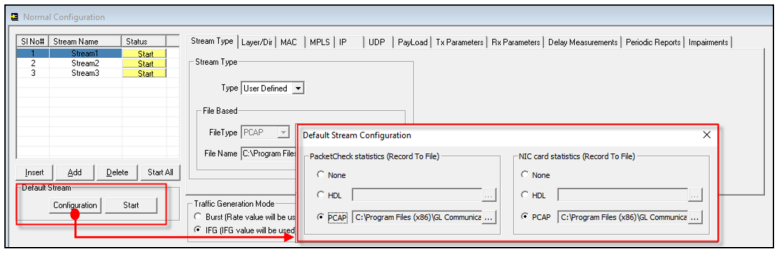


Figure: Default Stream Configuration

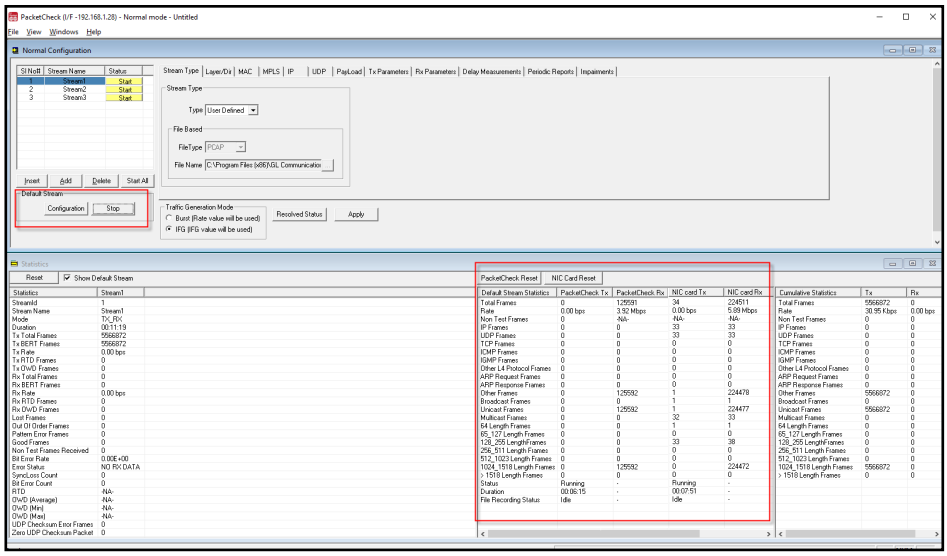


Figure: Default Stream Statistics

Impairments

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

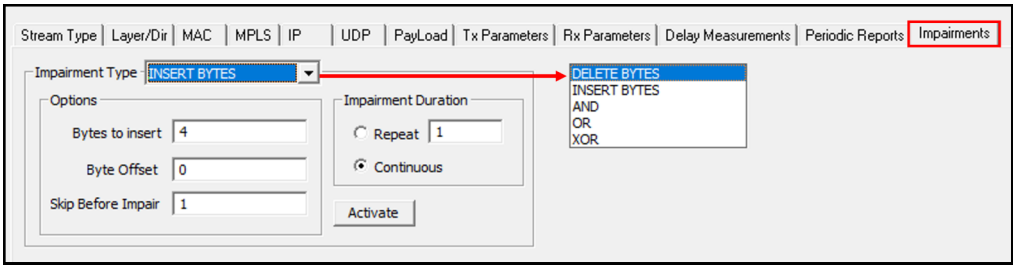


Figure: Impairments Configuration

The following Impairment Types are supported in PacketCheck™:

Delete bytes:

Deletes 'X' number of bytes at specified offset for every 'Y' packets sent out for the stream. Repeat this for limited number of times or repeat continuously.

E.g : 20 bytes being deleted from every 11th frame sent at an offset of 18 bytes which will be repeated 500 times.

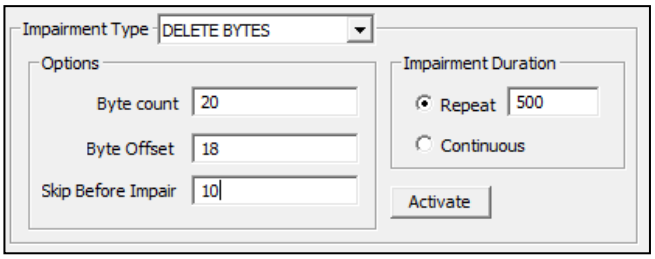


Figure: Delete Bytes Impairment Type

Insert bytes:

Insert 'X' number of bytes at specified offset for every 'Y' packets sent out for the stream. Repeat this for limited number of times or repeat continuously.

E.g.: "ABCD" **being** inserted within the frame at an offset of 14 bytes in every alternate frame, which will be repeated 500 times.

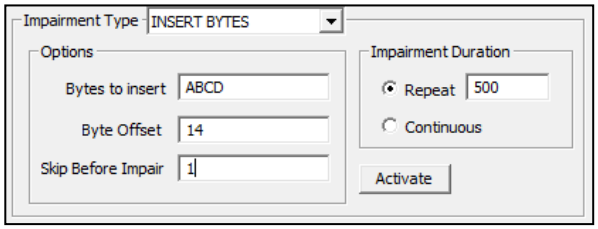


Figure: Insert Bytes Impairment Type

Logical AND

Modify a byte at specified offset for every 'Y' packets sent out for the stream. Modification is done by doing logical AND with the user specified Hex byte. Repeat this for limited number of times or repeat continuously.

E.g.: 56TH byte of every 17th frame being ANDed with 00 which will be repeated 20 times.

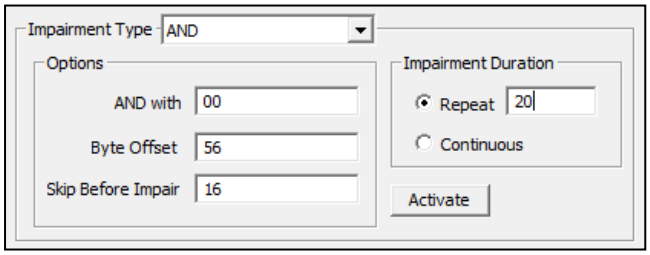


Figure: Logical AND Impairment Type

Impairments *(Contd.)*

Logical OR

Modify a byte at specified offset for every 'Y' packets sent out for the stream. Modification is done by doing logical OR with the user specified Hex byte. Repeat this for limited number of times or repeat continuously.

E.g.: 21st byte of every 6th frame being ORed with FF which will be repeated continuously.

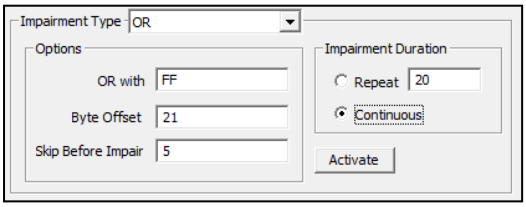


Figure: Logical OR Impairment Type

Logical XOR

Modify a byte at specified offset for every 'Y' packets sent out for the stream. Modification is done by doing logical XOR with the user specified Hex byte. Repeat this for limited number of times or repeat continuously.

E.g.: 36th byte of every 22nd frame being XORed with 55 which will be repeated 30 times.

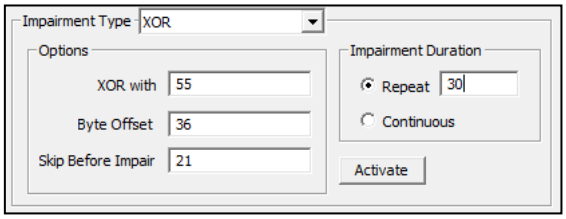


Figure: Logical XOR Impairment Type

Tx and 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.

Statistics

Reset

Statistic	Stream1	Stream2	Stream3	Stream4	Stream5
StreamId	1	2	3	4	5
Stream Name	Stream1	Stream2	Stream3	Stream4	Stream5
Mode	RX	RX	RX	RX	RX
Duration	00:00:04	00:42:46	00:42:46	00:42:46	00:42:46
Tx Frames	0	0	0	0	0
Tx Rate	0.00 bps	0.00 bps	0.00 bps	0.00 bps	0.00 bps
Rx Frames	33	0	13453	13457	13464
Rx Rate	0.00 bps	0.00 bps	0.00 bps	0.00 bps	0.00 bps
Lost Frames	57	0	3	3	3
Out Of Order Frames	0	0	0	0	0
Pattern Error Frames	0	0	0	0	0
Good Frames	0	0	0	0	0
Non Test Frames Received	0	0	142	0	0
Bit Error Rate	0.00E+00	0.00E+00	1.27E-06	1.43E-06	2.04E-06
Error Status	NO RX DATA	NO RX DATA	NO RX DATA	NO RX DATA	NO RX DATA
SyncLoss Count	0	0	3	3	3
Bit Error Count	0	0	25	28	40
RTD	-NA-	-NA-	-NA-	-NA-	-NA-
OWD (Average)	409.00 usecs	0.00 usecs	309.60 usecs	176.91 usecs	391.26 usecs
OWD (Min)	409.00 usecs	0.00 usecs	197.00 usecs	69.00 usecs	107.00 usecs
OWD (Max)	409.00 usecs	0.00 usecs	9.04 msecs	641.00 usecs	528.00 usecs
UDP Checksum Error Frames	0	0	0	0	0
Zero UDP Checksum Packet	0	0	0	0	0

Figure: Tx and Rx Statistics

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.

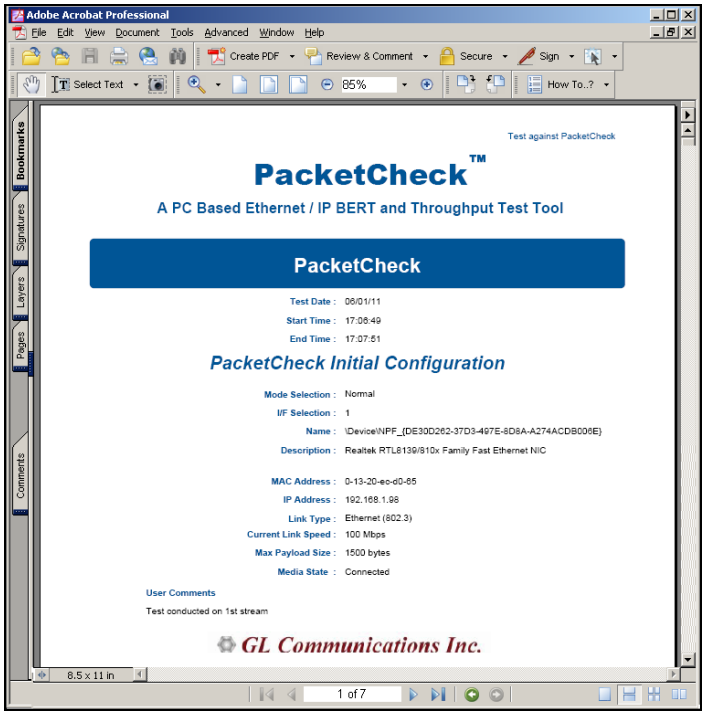


Figure: PacketCheck™ Report

MFR-IP-PacketCheck™ Traffic

MFR-IP-PacketCheck™ traffic option allows IP traffic generation and reception over FR links. Multiple IP traffic streams can be generated and processed over multiple VCs created within the FR links. Each IP traffic streams can be configured to modify the IP packets with desired custom headers to emulate various protocols.

MFR-IP-PacketCheck™ traffic is used to generate and receive IP packet streams to and from a FR router. The FR Router shall be tested for routing the received packets to the proper destination. Using GL's IP tools like PacketCheck™ and PacketExpert™, one can conduct end-to-end testing of the FR link through the FR router.

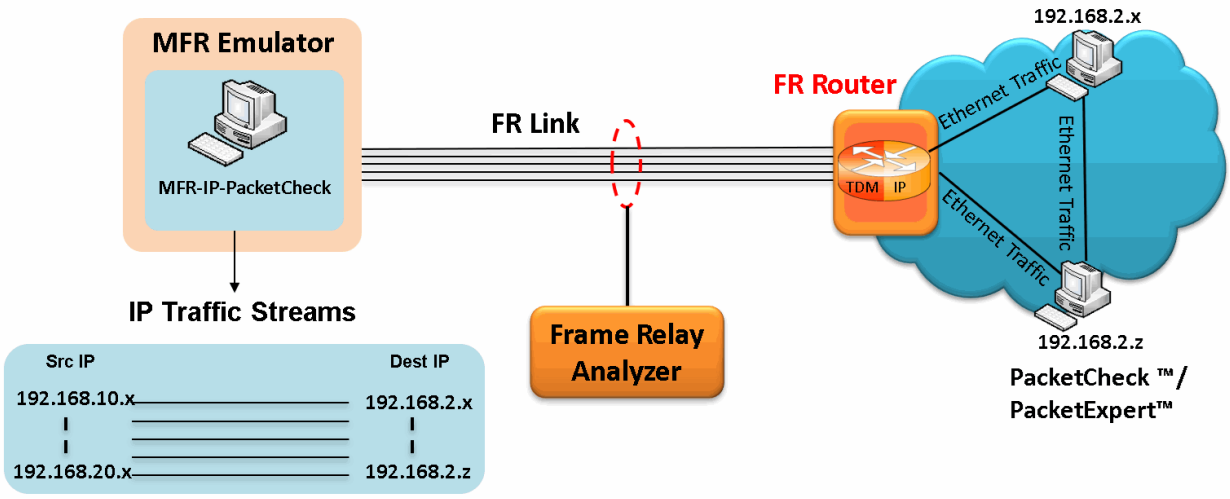


Figure: MFR-IP PacketCheck™

Buyer's Guide

Item No	Product Description
ETH100	PacketCheck™
ETH200	Two PacketCheck™ applications

For more information, refer to PacketCheck™ - Software Ethernet/IP Tester webpage.

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