PacketCheck™– Software Ethernet Tester

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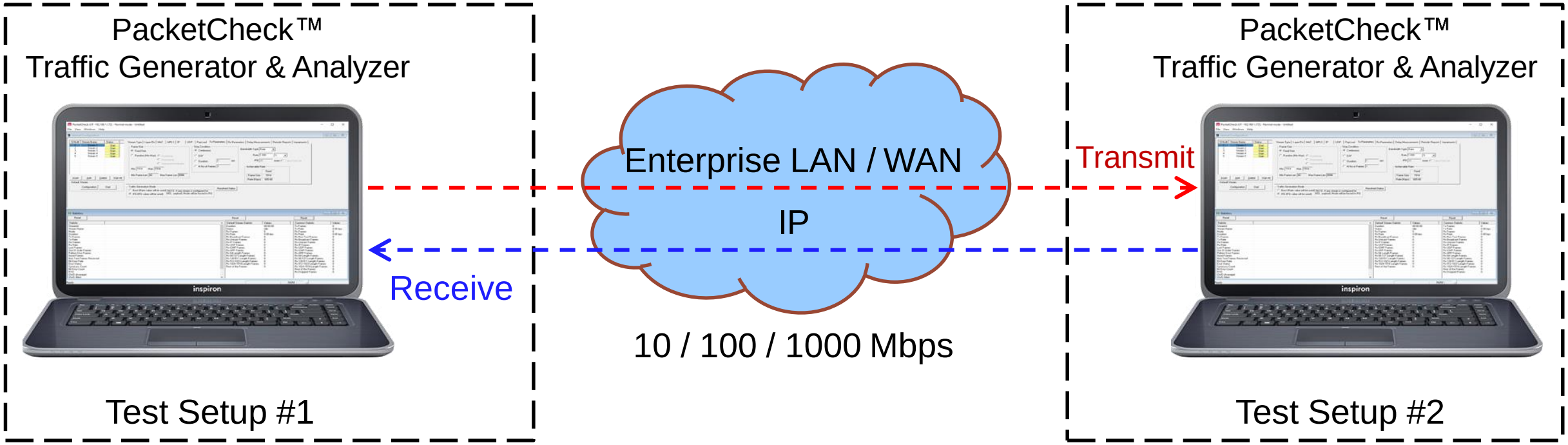
PacketCheck™- Ethernet / IP Test Tool



- PacketCheck™ uses the PC's network interface card to transmit and receive Ethernet or IP packets
- Bit Error Rates (BER) and throughputs and Delay, Impairment (up to 500 Mbps) can be easily tested
- Generates multi-stream Ethernet / IP / UDP traffic as well single-stream physical layer traffic
- Measures end to end performance such as bit error rate, total packets, packet loss, out of sequence packets, errored packets, Round Trip Delay, and One Way Delay (within the same PC)

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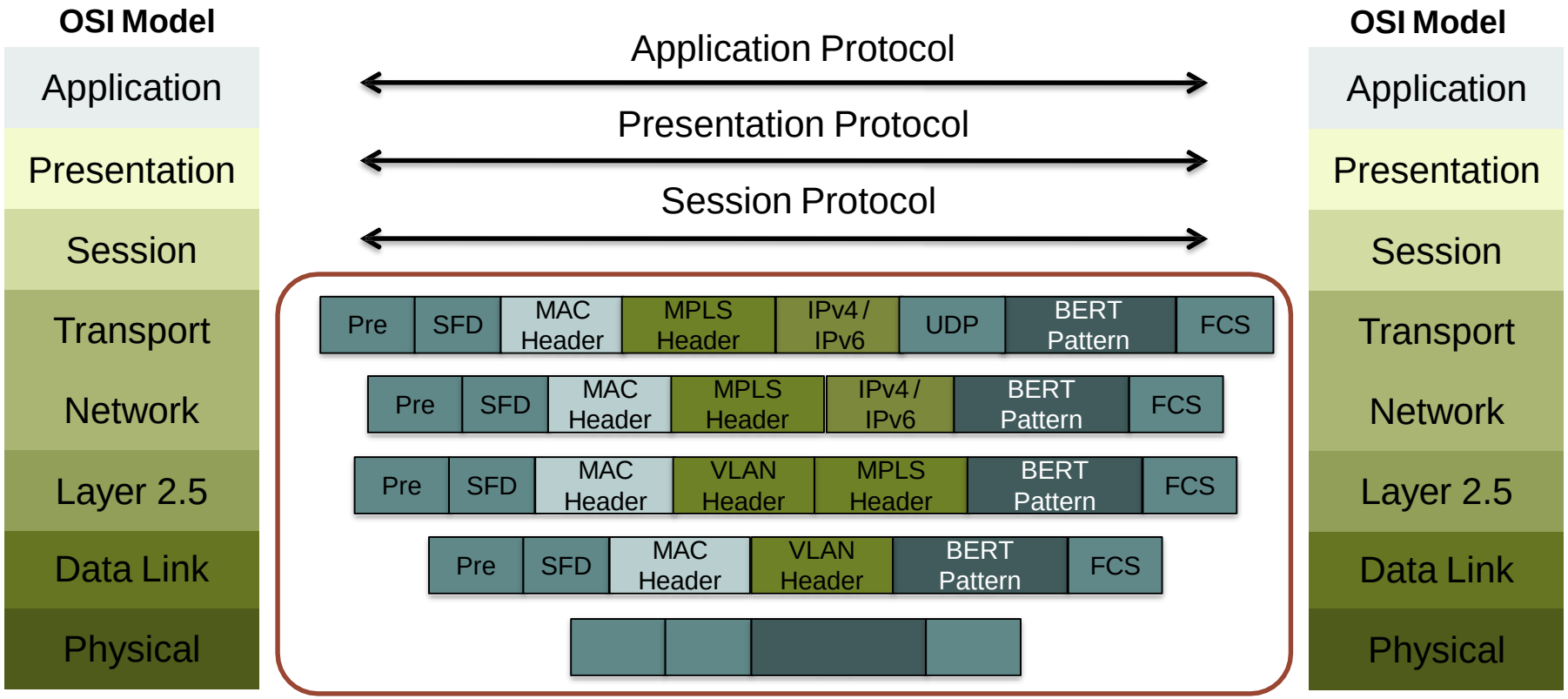
Applications

- What is the maximum IP bandwidth between your branch offices?
- What is the round-trip delay between two IP addresses with microsecond accuracy? Between two Ethernet MAC addresses?
- Is your LAN switch dropping packets? Introducing errors? Blocking traffic because it's overloaded?
- Is your CAT 5 or CAT 6 wiring deteriorating? Introducing errors?
- Need to find out your bandwidth between enterprise locations? Traffic overload? Throughput? Error rates? Delay?

Testing at Layer 1, 2, 3, & 4 of OSI Model



Host A

Preamble – 7 Bytes
Start Frame Delimiter – (SFD)- 1 Byte
MAC Header –

- Dest/Src MAC Address – 6 Bytes
- EtherType field – 2 Bytes (0x0800) IP

VLAN Header - 4 bytes each

Framing Representation

MPLS Header - 4 bytes each
IP Header – 20 Bytes
UDP Header – 8 Bytes
Payload – BER Test Pattern
Frame Check Sum – (FCS) – 4 Bytes

Ethernet Payload

Host B

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Main Features

- Capability to test Ethernet traffic of up to 500 Mbps bandwidth. Supports minimum line rate of 64 Bps
- 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
- 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
- Provides options to record unidentified network traffic which does not belongs to any user defined stream into a PCAP or HDL file format and analyze the recorded traffic in Wireshark® or PacketScan™ application
- Generate and verify PRBS patterns such as QRSS, 2^6-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, & 2^{23}-1
- Measures bit error rate, synchronization status, throughput, packet loss, out of order packets, round trip delay, etc.
- Impair traffic such as inserting, deleting or changing bytes
- Supports jumbo frames in addition to all normal frame sizes from 64 bytes to 1518 bytes

Main Features (Contd.)

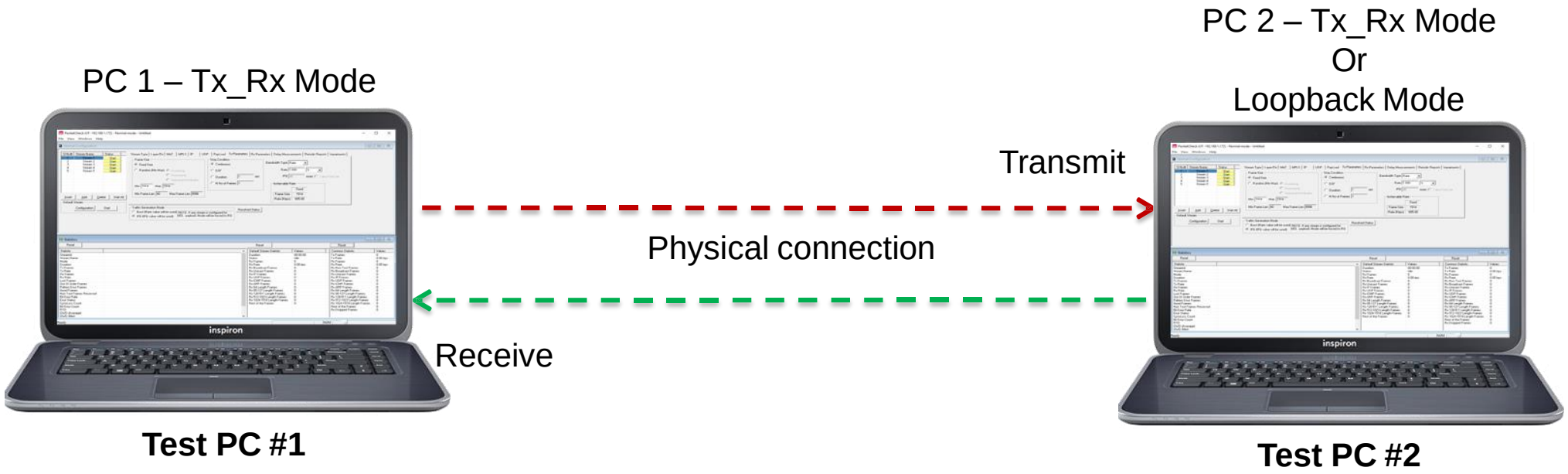
- Customizable protocol headers like MAC source / destination address, EtherType field, IP source / destination address, and UDP source / destination port
- Create multiple full-duplex streams per PacketCheck™ easily
- Each stream can be configured as Transmit Only, Receive Only, or Transmit and Receive
- 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 Layer2 (Ethernet) or Layer3 (IP) or Layer4 (UDP)
- For Layer3 or Layer4 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 also supported (depending on the NIC card support for Jumbo frames)
- 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

Main Features (Contd.)

- In Burst mode, each stream's rate can be set in Mbps, Kbps, etc.
- 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
- 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
- Frame sizes from 22 bytes up to 1518 supported
- 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
- 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

BER Test Setup at Layer 1

Scenario 1: Source & destination PCs connected using Ethernet cable



- The PCs are connected using an Ethernet cable. The payload includes PRBS and fixed patterns

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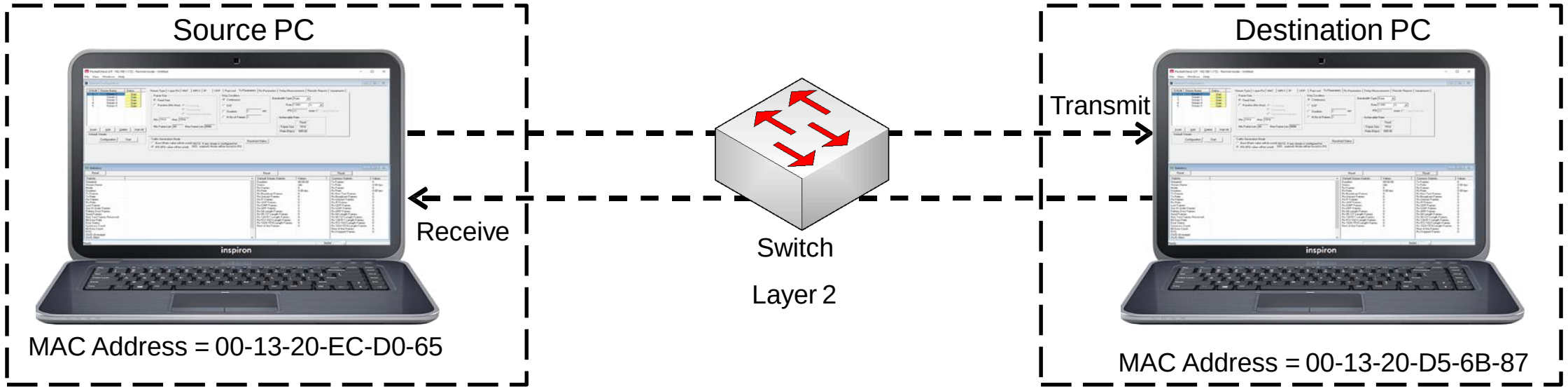
BER Test Setup at Layer 2

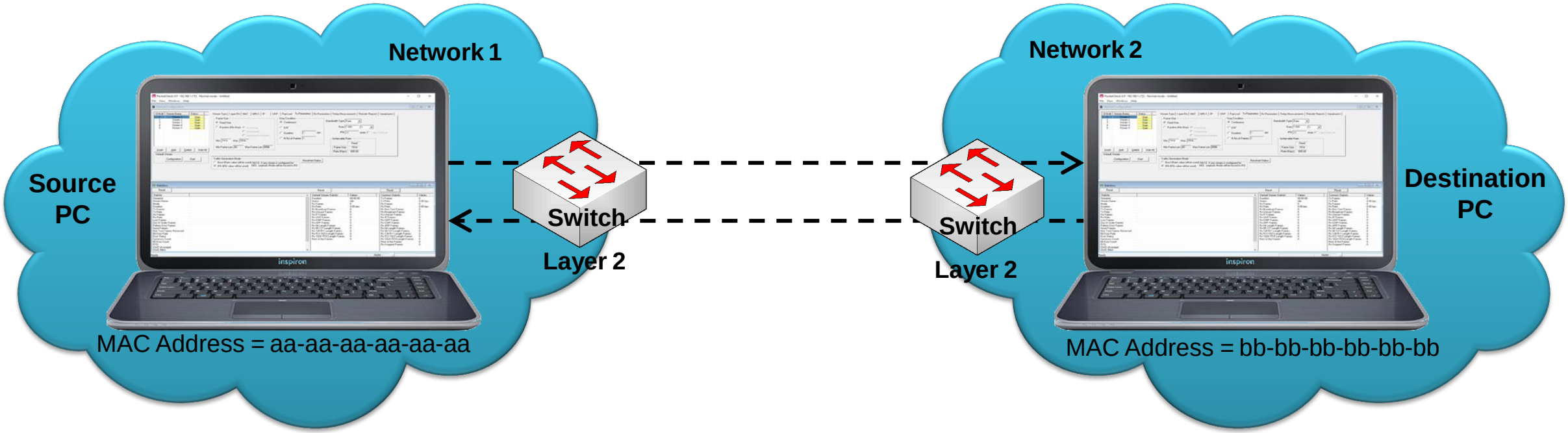
Scenario 2: Source & destination PCs on the same LAN, connected by a switch



- The PCs are connected through a switch, which routes the packets based on the MAC address

BER Test Setup at Layer 2

Scenario 3: Source & destination PCs located in different LANs connected through multiple switches



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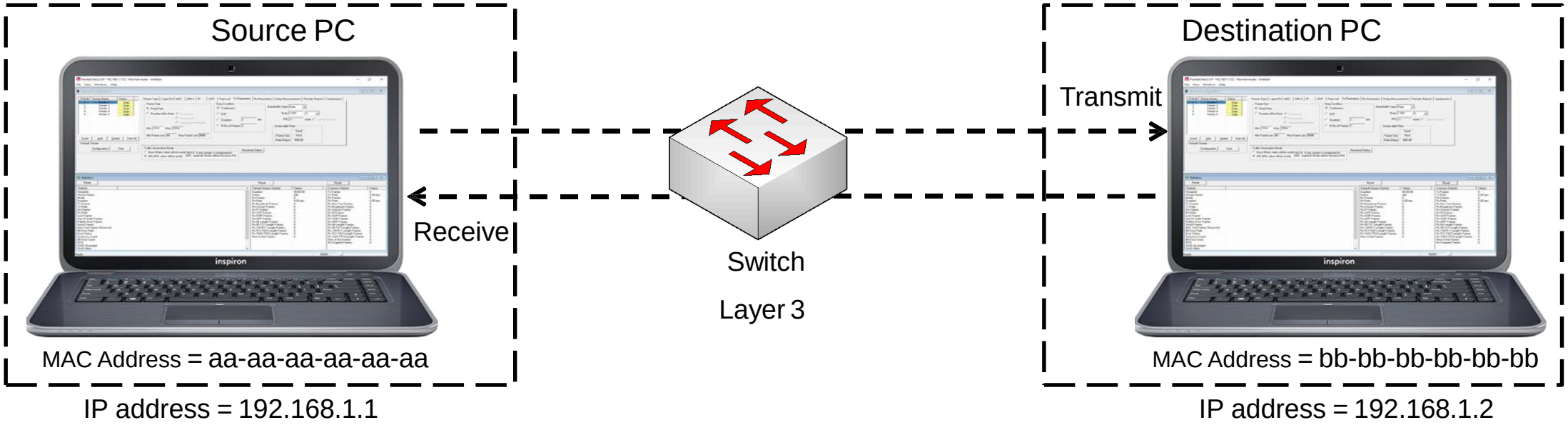
BER Test Setup at Layer 3 / 4

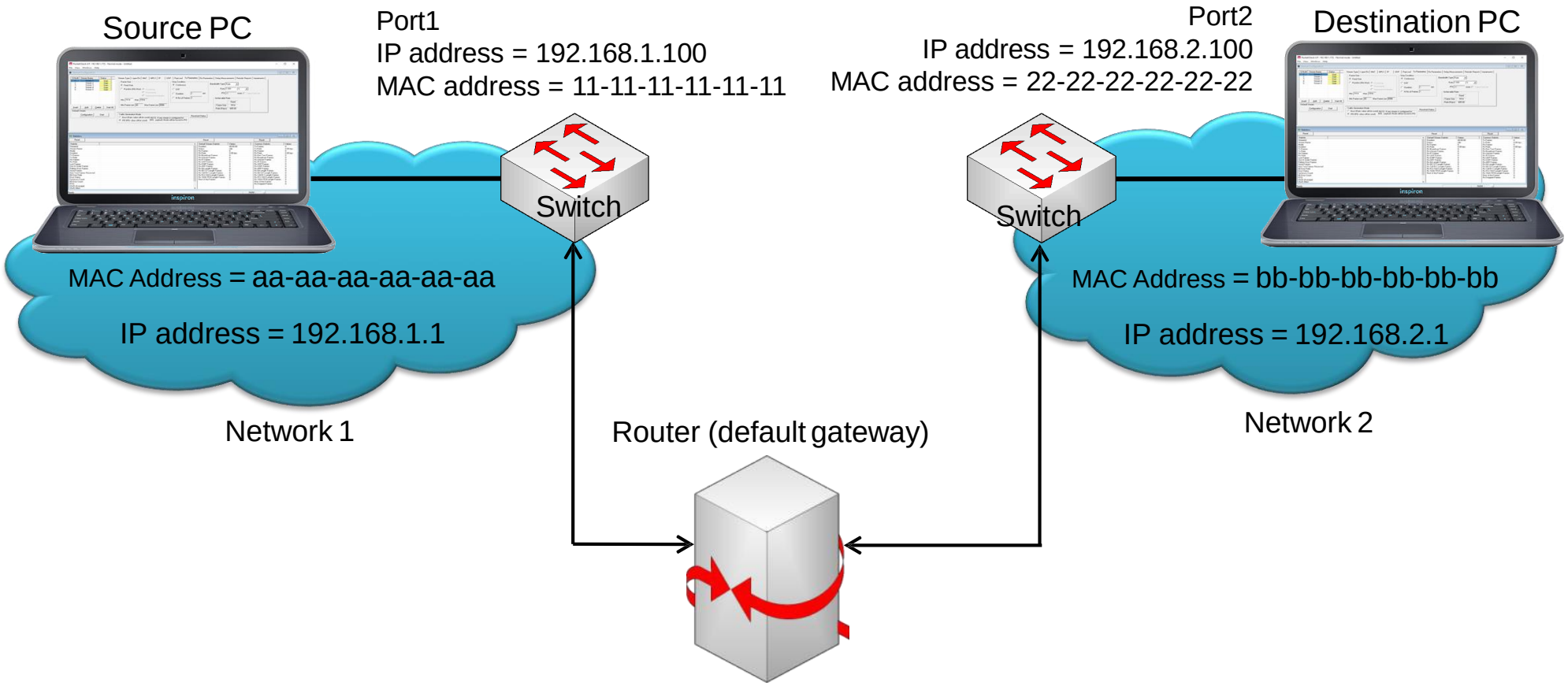
Scenario 4: Source & destination PCs are located within the same IP Network



- Packets route between the source and destination PCs based on both the IP address and MAC address

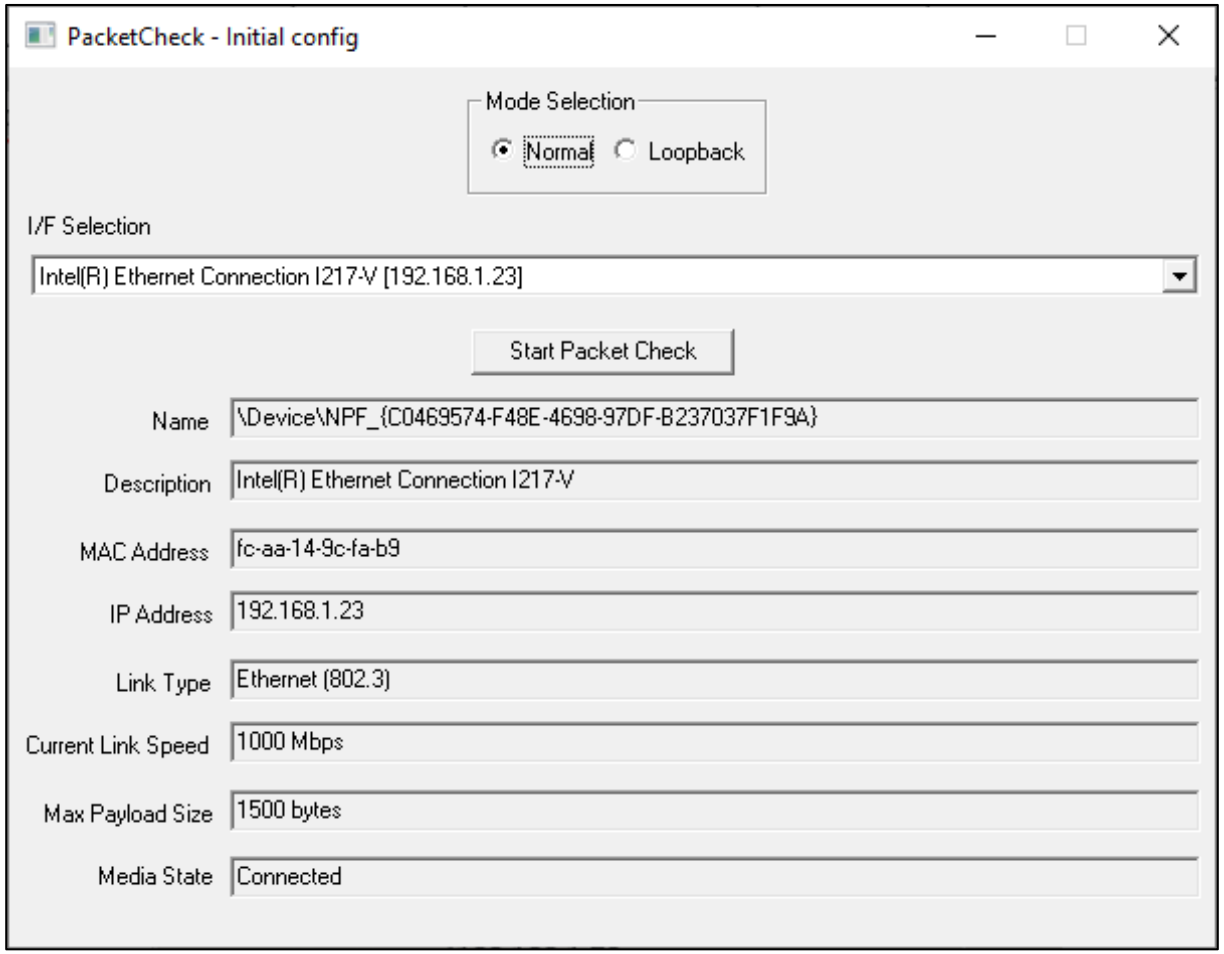
BER Test Setup at Layer 3 / 4

Scenario 5 : Source & destination PCs located on different IP Networks



- Source and destination PCs are located in different IP networks connected via routers

Initialization Configuration



- PacketCheck™ operates in normal and loopback mode
- Verify interface, IP and MAC address
- PacketCheck™ PC configuration file is automatically generated containing initial configuration parameters displayed in the GUI

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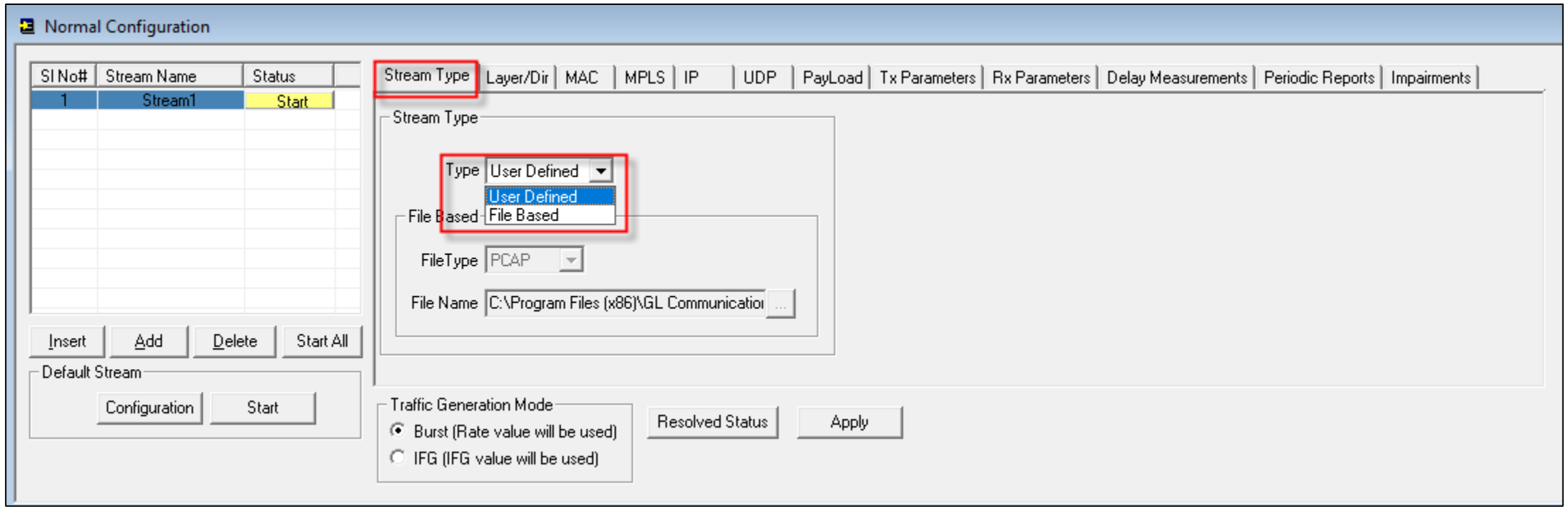
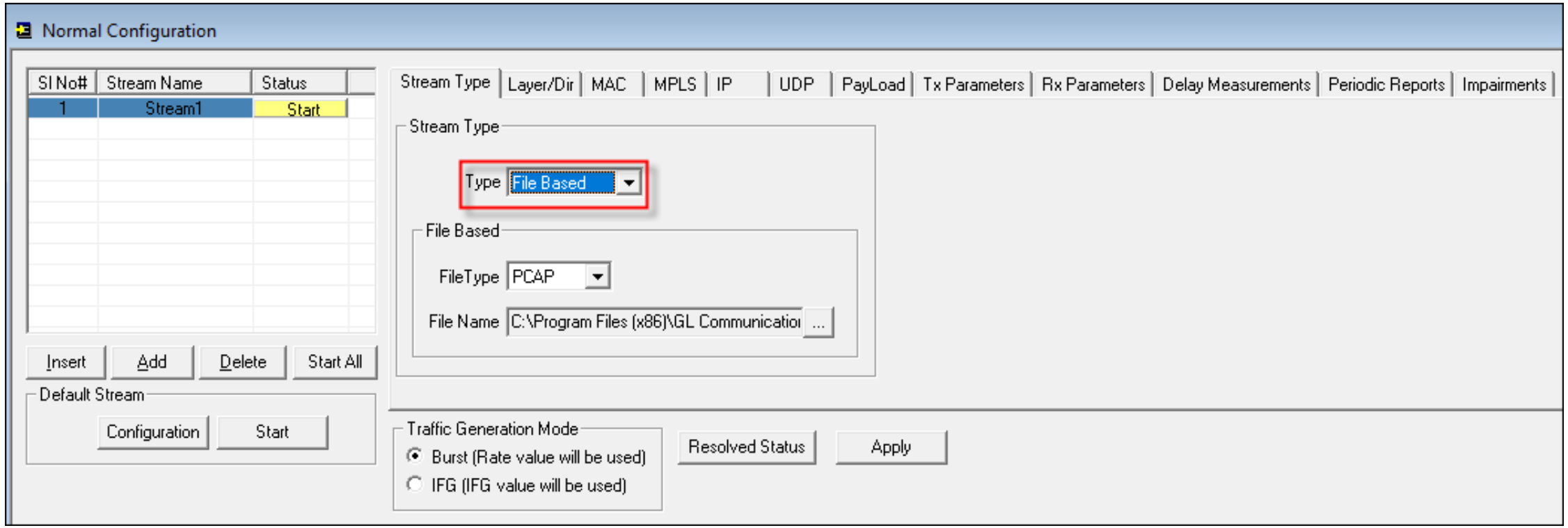
Stream Types Selection



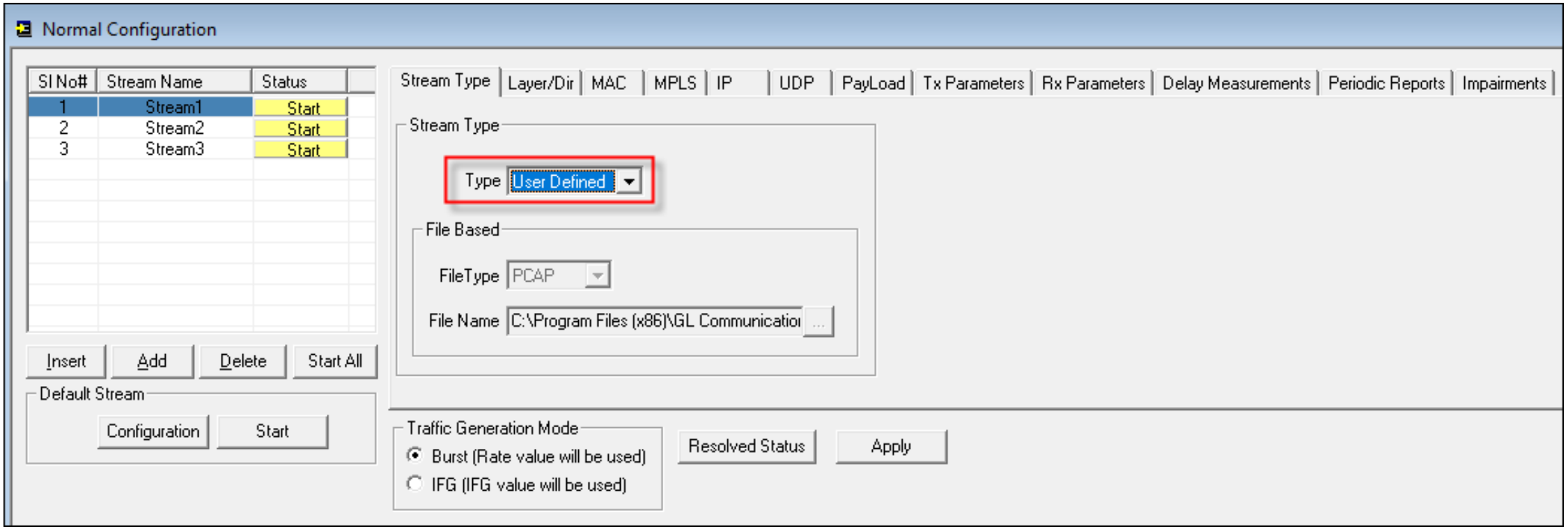
File Based Stream Type

- Allows to specify a source file for the stream, this source file can be PCAP or HDL file format
- 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

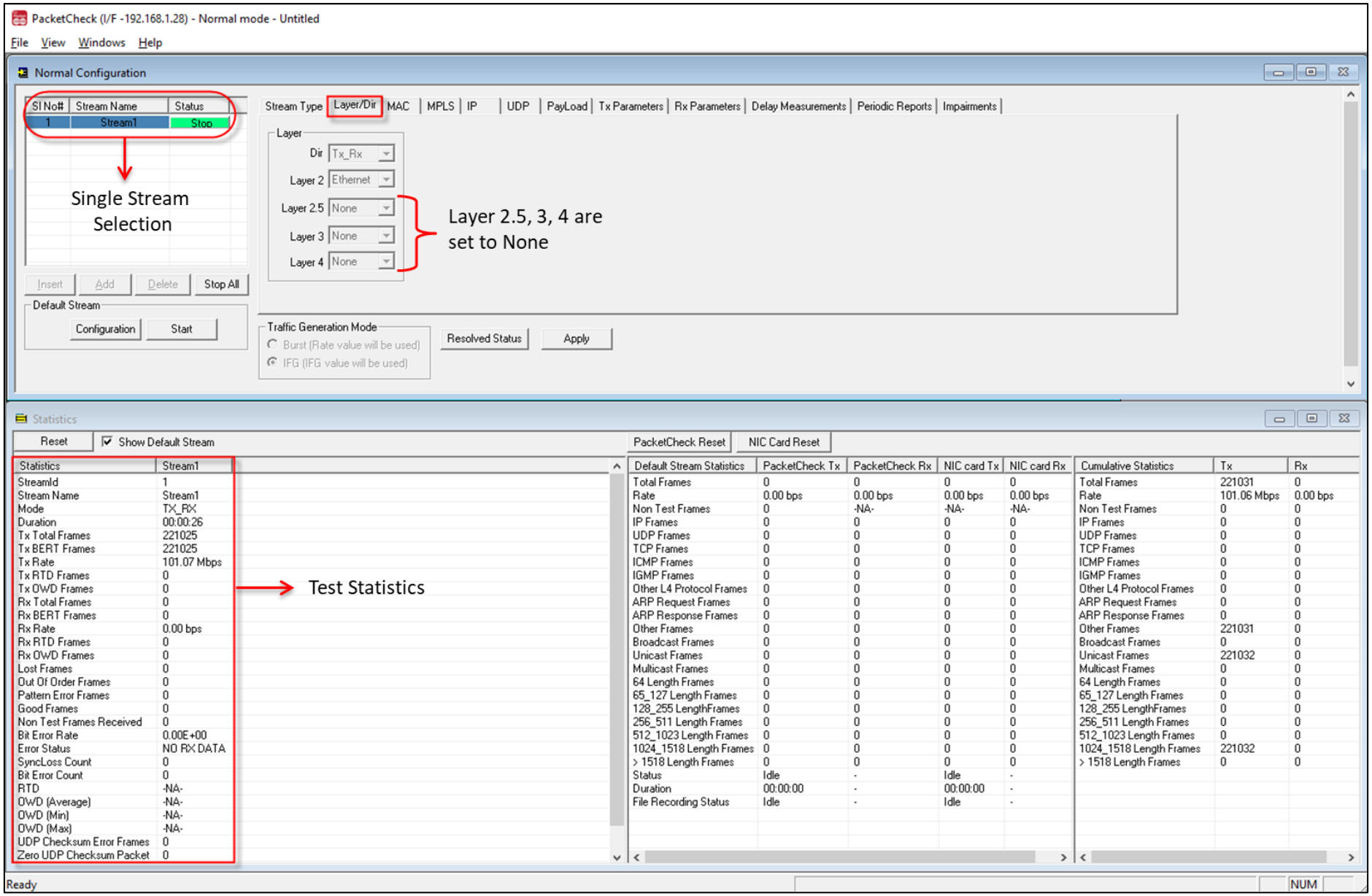


User Defined Stream Type

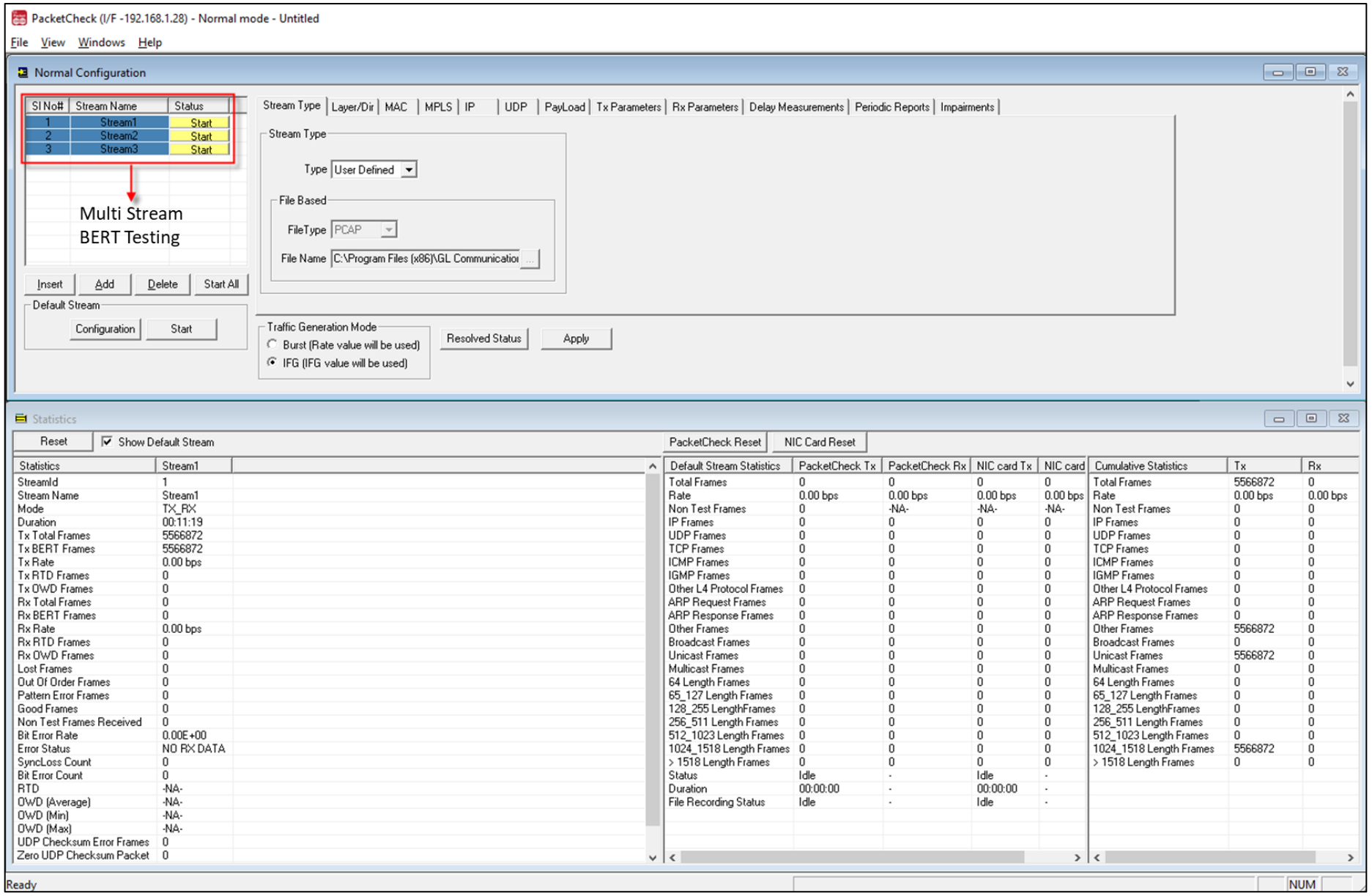
- Allows to define the stream parameters such as Layer, Ethernet/IP/UDP Headers, Frame Size, Rate, Payload etc. and the PacketCheck™ generates/analyzes the stream traffic as per these parameters.



Layer 1 Single-stream Generation



Layer 2 / 3 / 4 Multi-stream Generation



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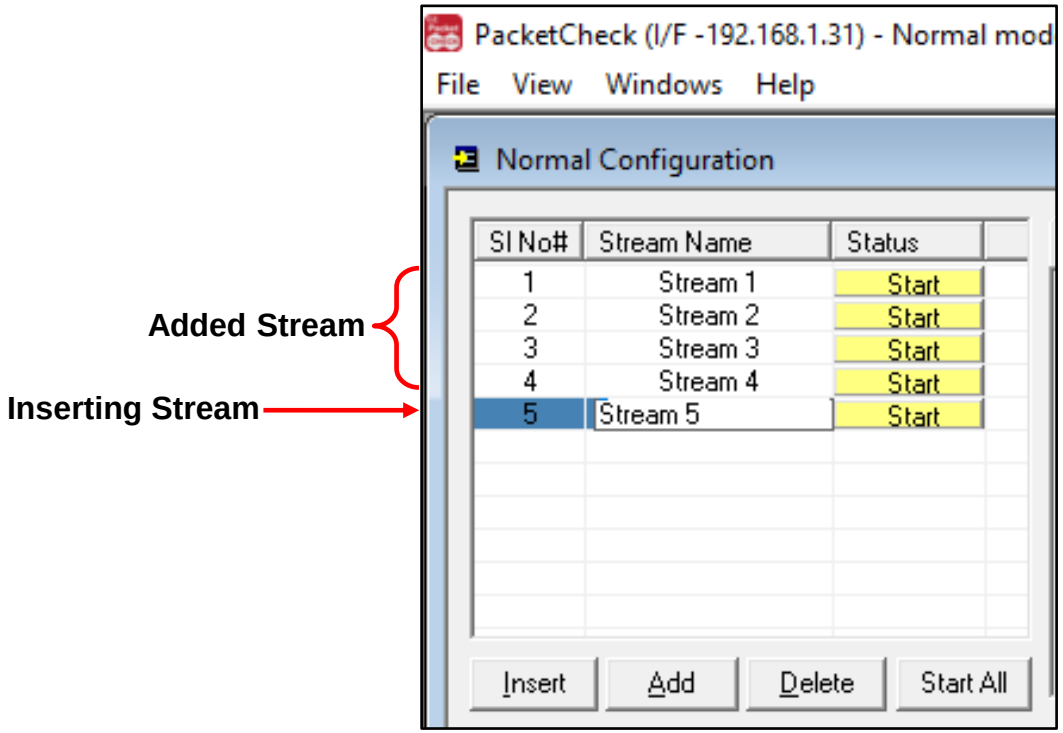
Add / Insert / Delete Streams



- PacketCheck™ allows for multi-stream generation
- Each stream can be configured to Tx, Rx or both Tx_Rx in layer 2, layer 3, and layer 4

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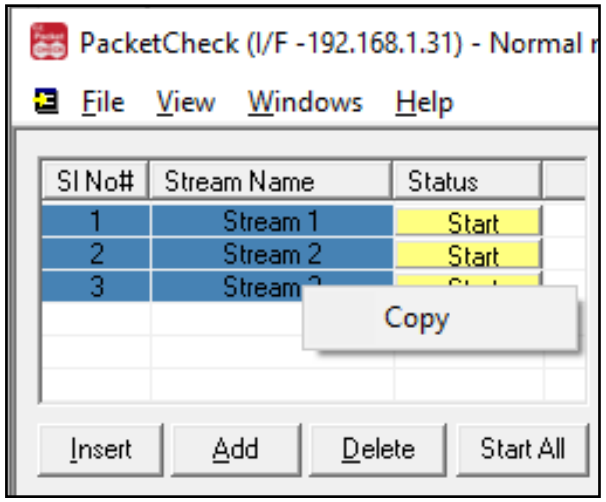
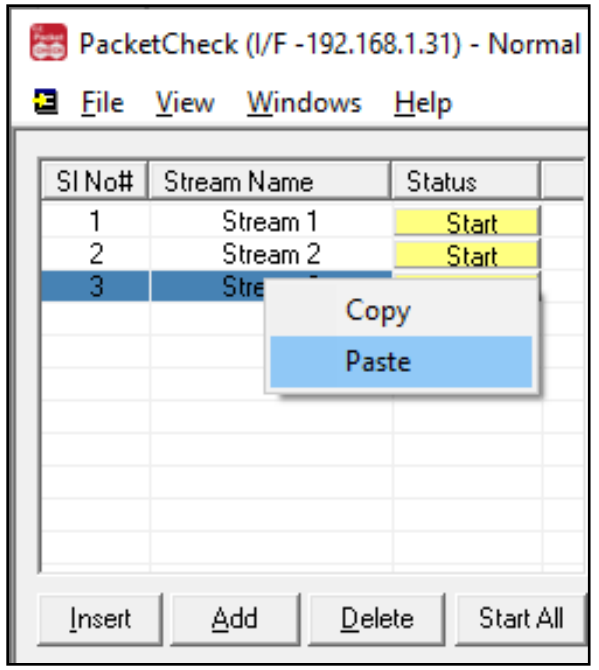
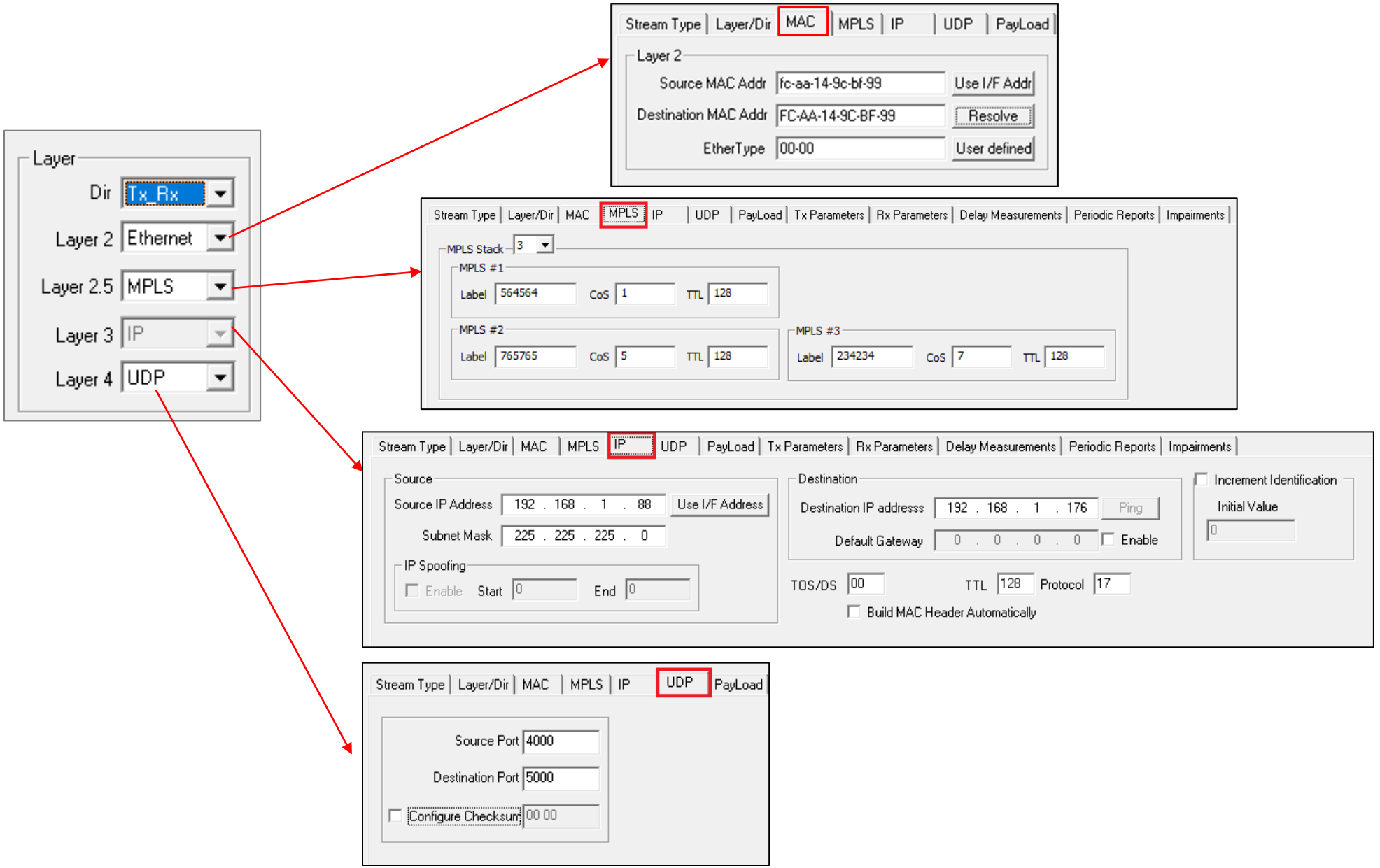
Copy and Paste Streams



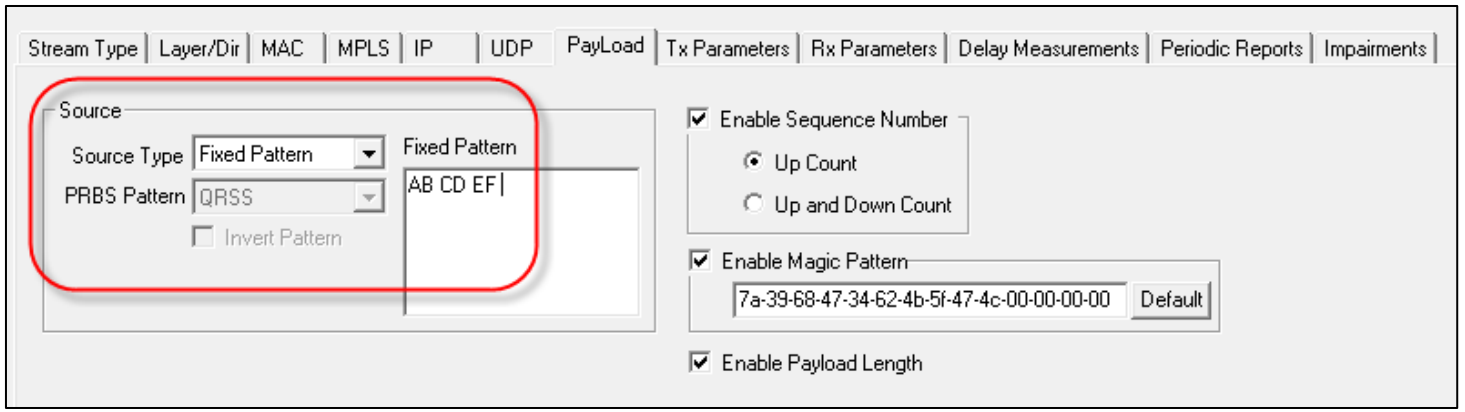


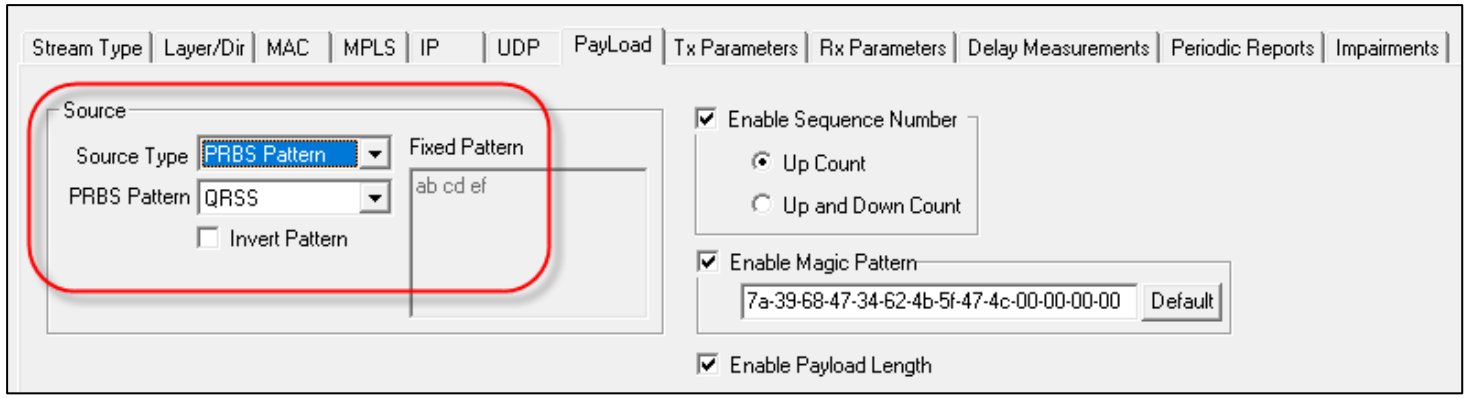
- Provides options to copy from one stream to another (both one-to-one copy and one-to-many copy) to quickly configure multiple streams

MAC / IP / UDP Configurations



Payload





Payload Source Types –

- Fixed Patterns – pattern repeats throughout the packet's payload. Configure test pattern of 2 bytes. Eg: AB-CD, BD-EF, and so on to achieve pattern sync
- PBRS Patterns - generates PRBS patterns e.g. QRSS, 2^6-1, 2^9-1, 2^11-1, 2^15-1, 2^20-1, and 2^23-1

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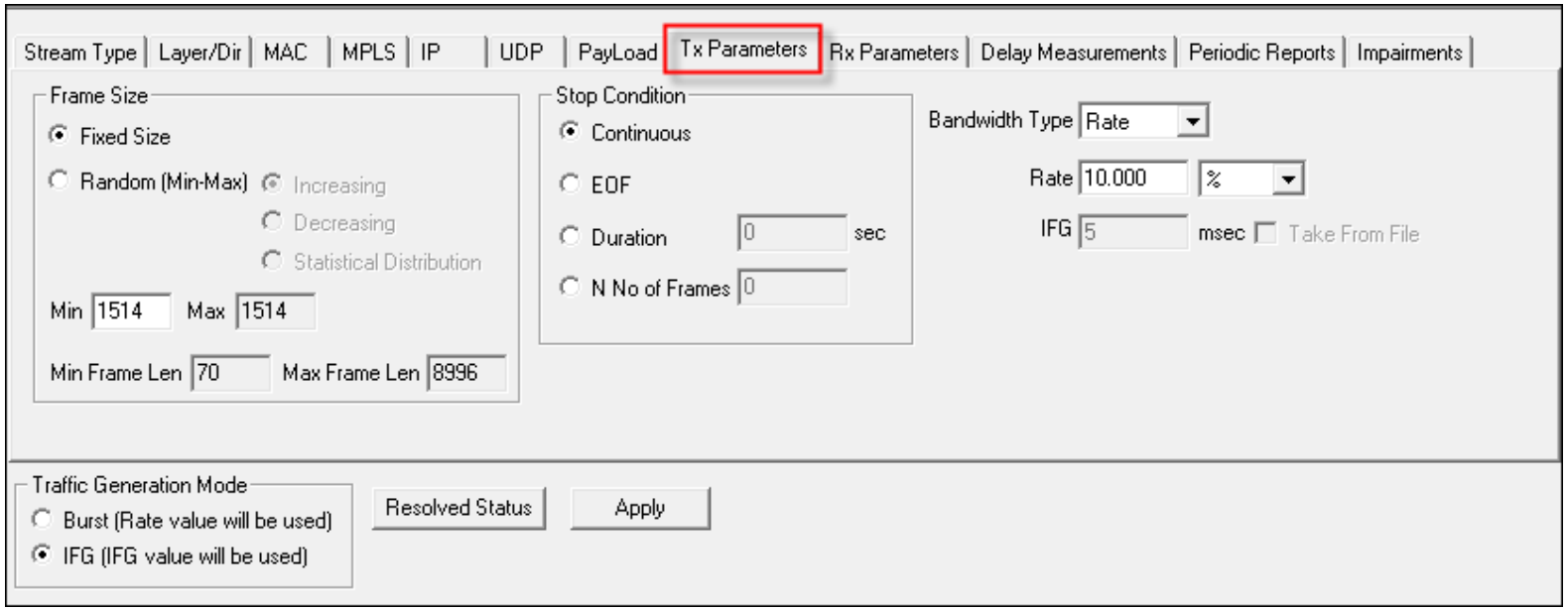
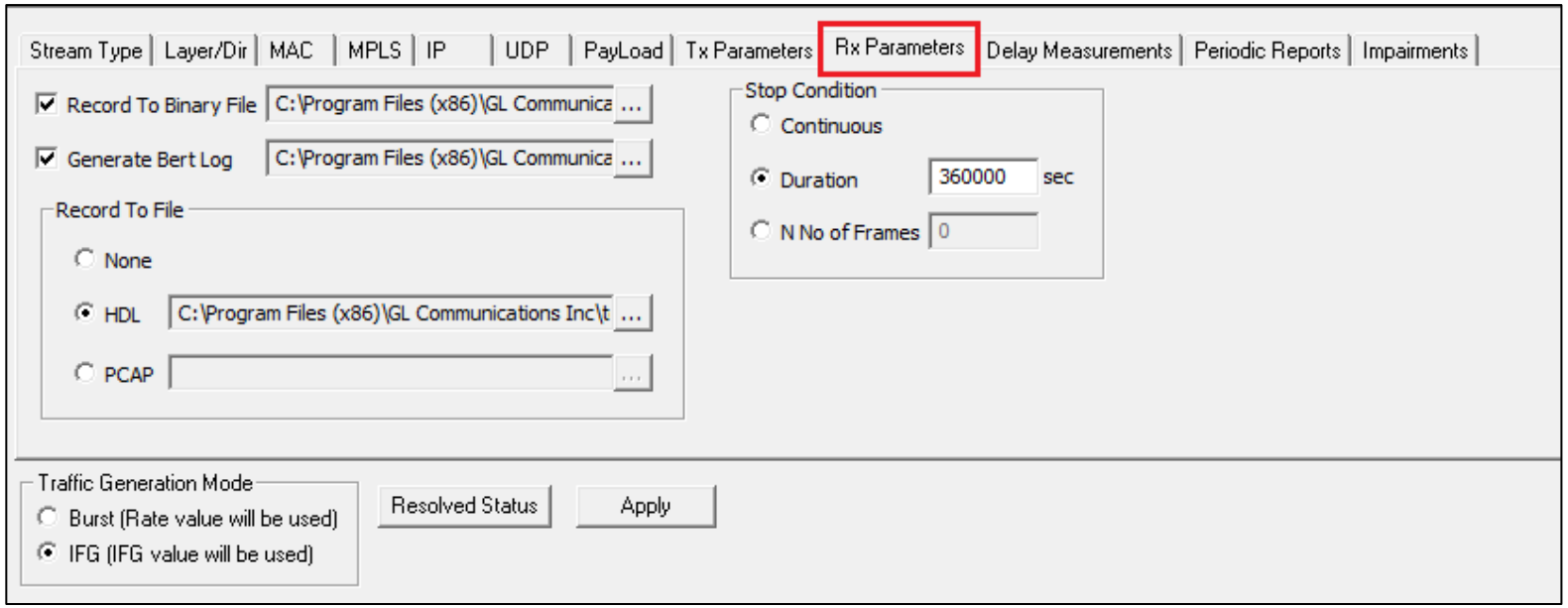
Tx and Rx Parameters

- Tx streams can be set to transmit frame with fixed / random sizes, specific duration, count, IFG, and rate
- Rx streams can be set to generate Binary, HDL (GL proprietary), PCAP (Wireshark®) file formats, and BERT log files
- Stop conditions to limit the fixed / PBRS pattern file transmission and logging of the received patterns to a defined file





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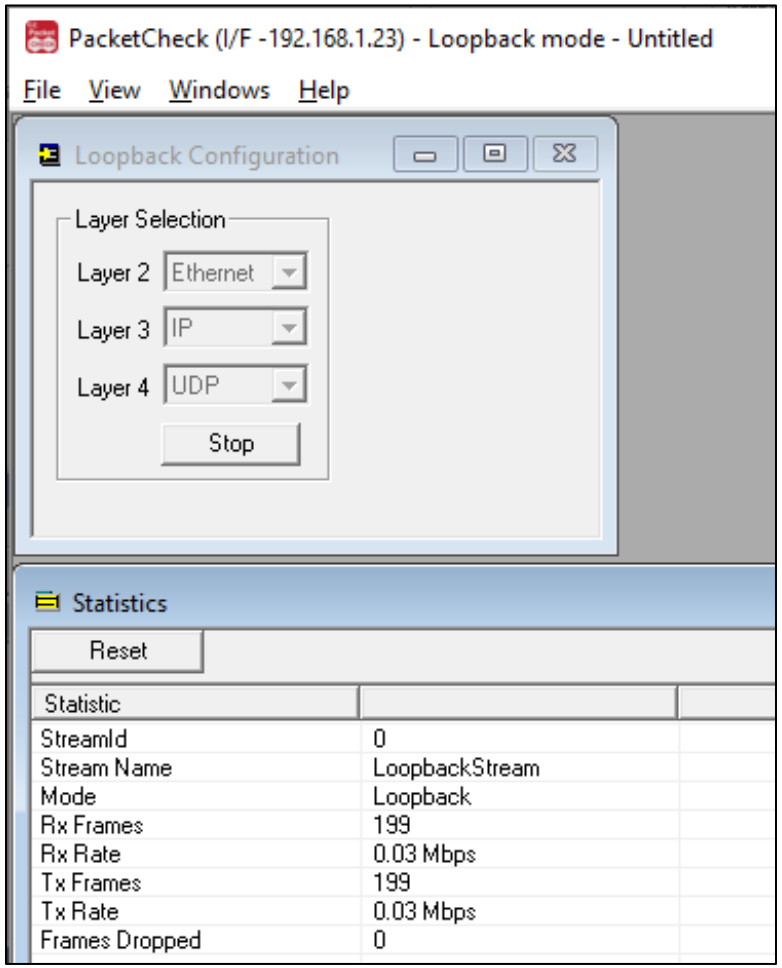
Loopback Mode

- PacketCheck™ can operate in Loopback mode.

  PacketCheck™ can perform loopback at the Ethernet, IP and UDP levels



Statistics

Normal Mode

Reset | Show Default Stream

Statistics	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	00:00:25	00:00:25	00:00:25	00:00:25	00:00:25
Tx Total Frames	0	0	0	0	0
Tx BERT Frames	0	0	0	0	0
Tx Rate	0.00 bps	0.00 bps	0.00 bps	0.00 bps	0.00 bps
Tx RTD Frames	0	0	0	0	0
Tx OWD Frames	0	0	0	0	0
Rx Total Frames	2072	2072	2072	2072	2072
Rx BERT Frames	2072	2072	2072	2072	2072
Rx Rate	978.73 Kbps	978.73 Kbps	978.73 Kbps	978.73 Kbps	978.73 Kbps
Rx RTD Frames	0	0	0	0	0
Rx OWD Frames	0	0	0	0	0
Lost Frames	0	0	0	0	0
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	0	0	0
Bit Error Rate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Error Status	SYNC	SYNC	SYNC	SYNC	SYNC
SyncLoss Count	0	0	0	0	0
Bit Error Count	0	0	0	0	0
RTD	-NA-	-NA-	-NA-	-NA-	-NA-
OWD (Average)	-NA-	-NA-	-NA-	-NA-	-NA-
OWD (Min)	-NA-	-NA-	-NA-	-NA-	-NA-
OWD (Max)	-NA-	-NA-	-NA-	-NA-	-NA-
UDP Checksum Error Frames	0	0	0	0	0
Zero UDP Checksum Packet	0	0	0	0	0
HDL/PCAP File Recording ...	Idle	Idle	Idle	Idle	Idle
Binary File Recording Status	Idle	Idle	Idle	Idle	Idle

Loopback Mode

Statistics

Reset

Stream Name	
StreamId	0
Stream Name	LoopbackStream
Mode	Loopback
Rx Frames	7756
Rx Rate	0.03 Mbps
Tx Frames	7756
Tx Rate	0.03 Mbps
Frames Dropped	0

Ready

- Receive (Rx) and Transmit (Tx) statistics in normal and loopback modes
- Options: Tx & Rx frames, bit error rates, sent frames, lost frames, out of order frames, pattern error, good frames, non-test frames received, error status, error count, sync loss count, frames dropped, impairments introduced into the outgoing traffic, UDP checksum error frames, and zero UDP checksum packets

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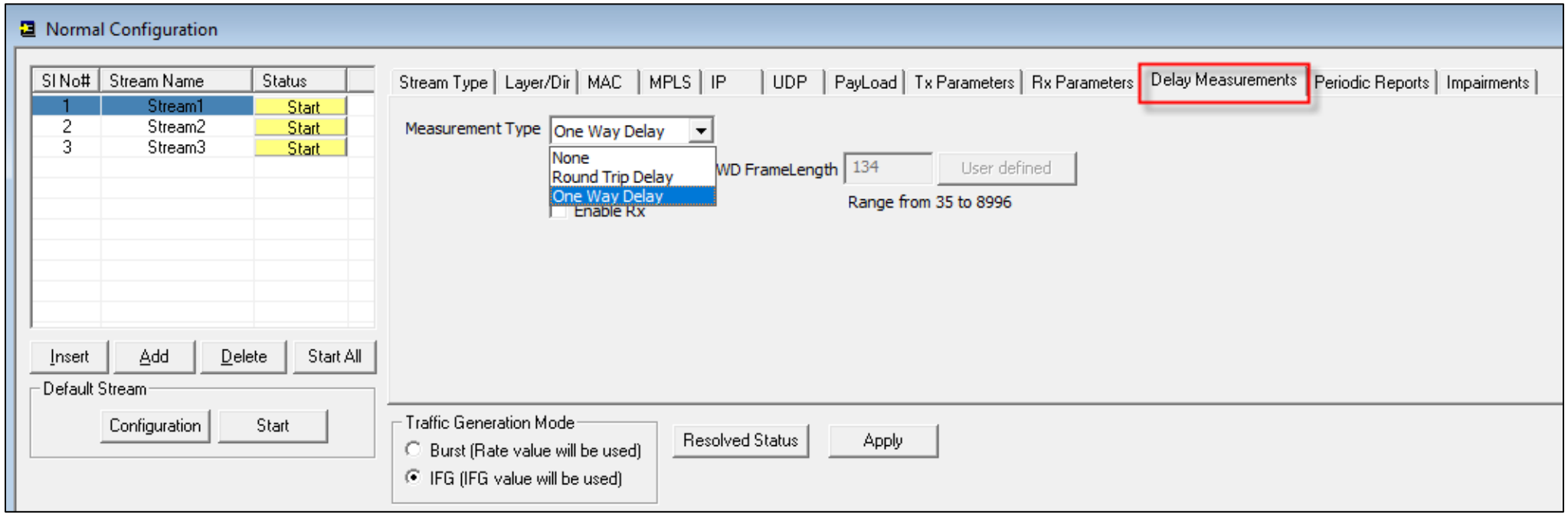
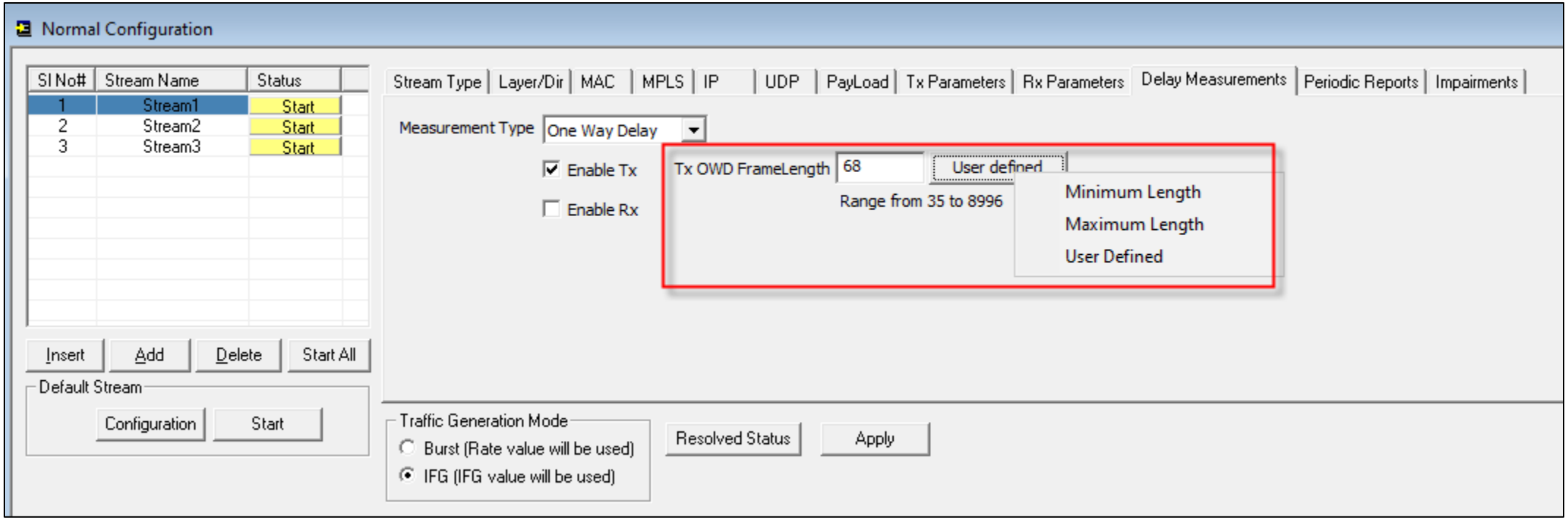
Delay Measurements

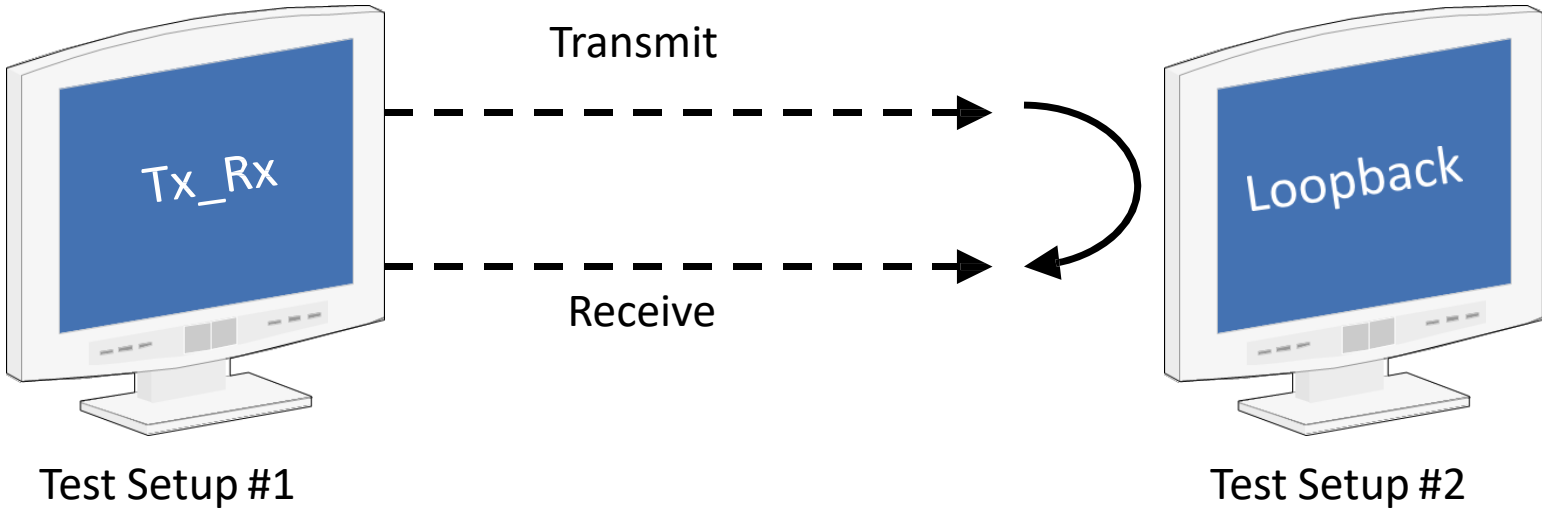
- PacketCheck™ can measure One-Way Delay (OWD), calculating the delay at the receiving end in µsec
- Also, PacketCheck™ can be configured to measure the average Round Trip Delay [RTD] value of each packet in µsec
- OWD and RTD provides user configurable frame length, minimum frame length, maximum frame length or can define any value within the range between 68



One Way Delay (OWD)

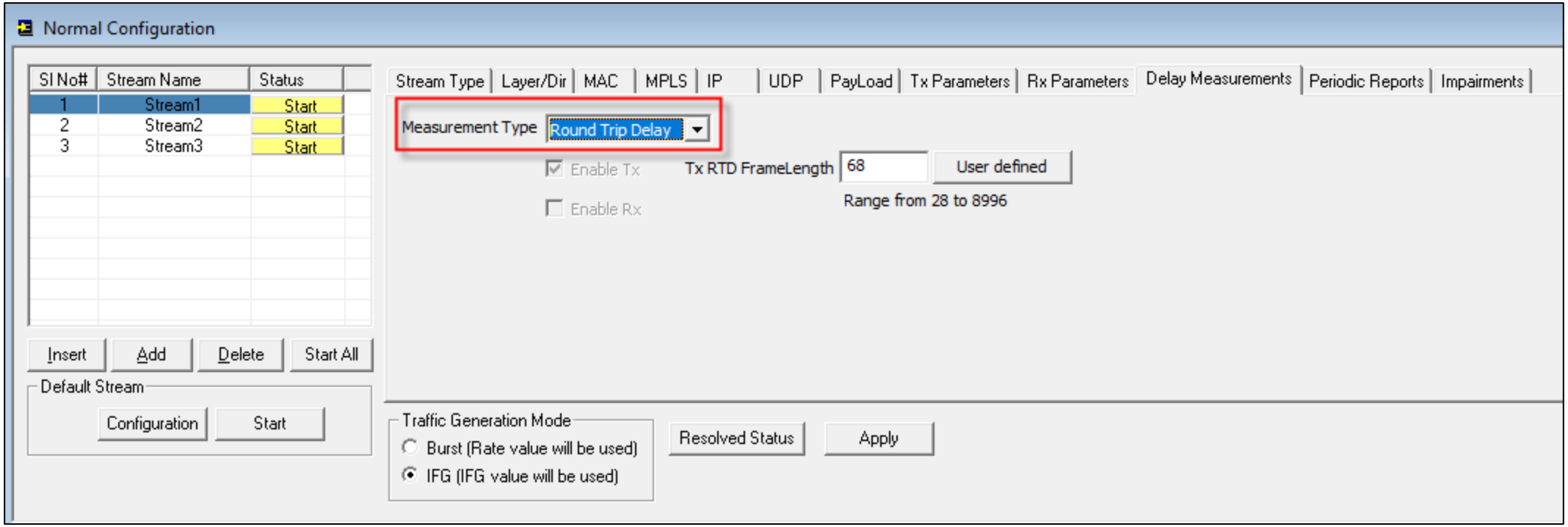


Round Trip Delay (RTD)

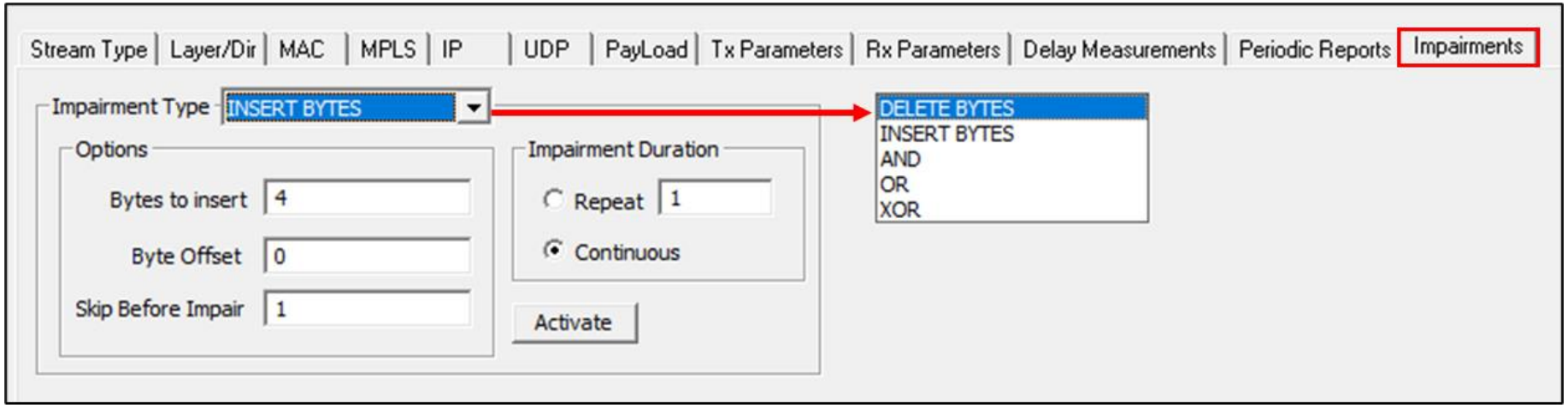


- Calculates the average Round Trip Delay with microsecond resolution
- RTD is the time taken for a packet to travel to the remote end and back to the source
- RTD calculated using 2 PacketCheck™ applications - one at the local end running in Tx_Rx (Transmit and Receive) mode and another at the remote end running in loopback mode

Round Trip Delay (RTD)



Run-time Impairment Generation



- Impairments can be introduced in 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

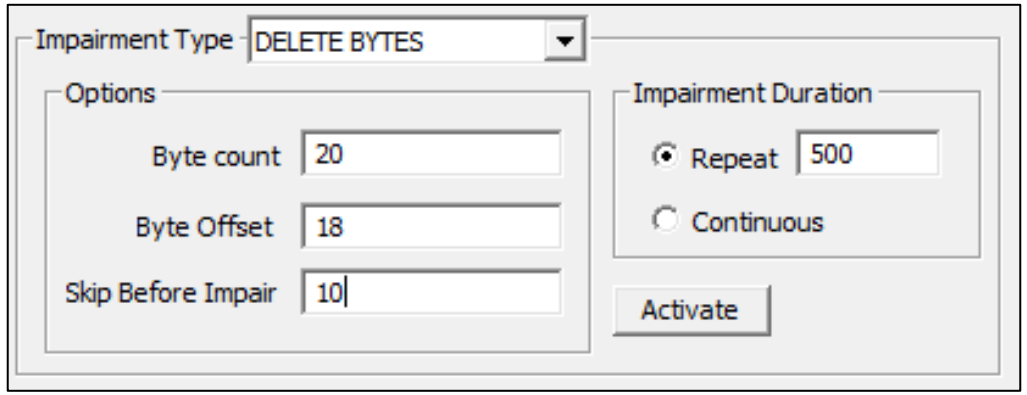
Impairments (Contd.)

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.

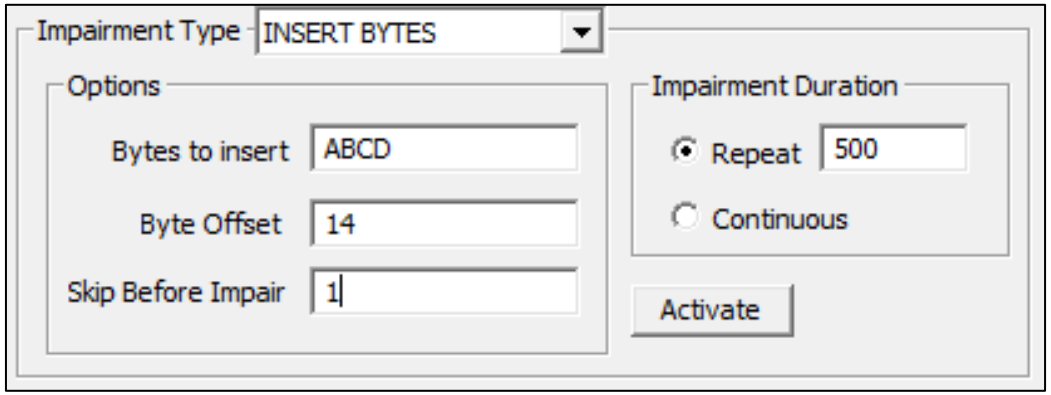
E.g. : 20 bytes being deleted from every 11th frame sent at an offset of 18 bytes which will be repeated 500 times



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.

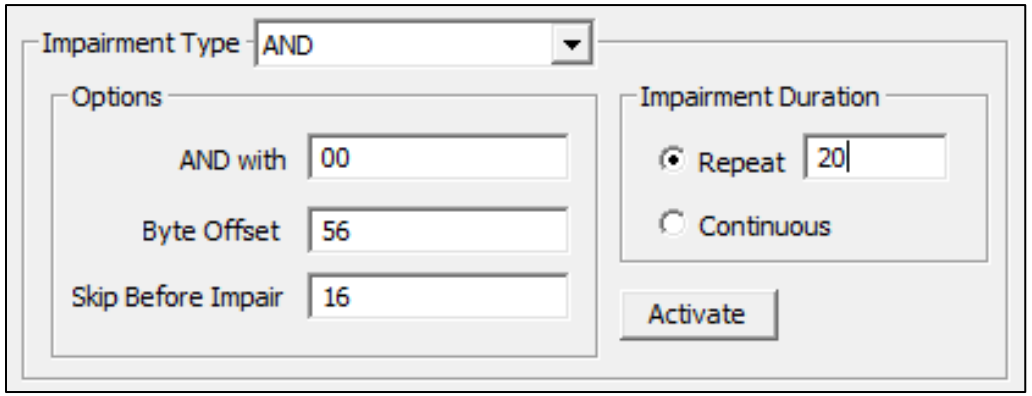


Impairments (Contd.)

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.

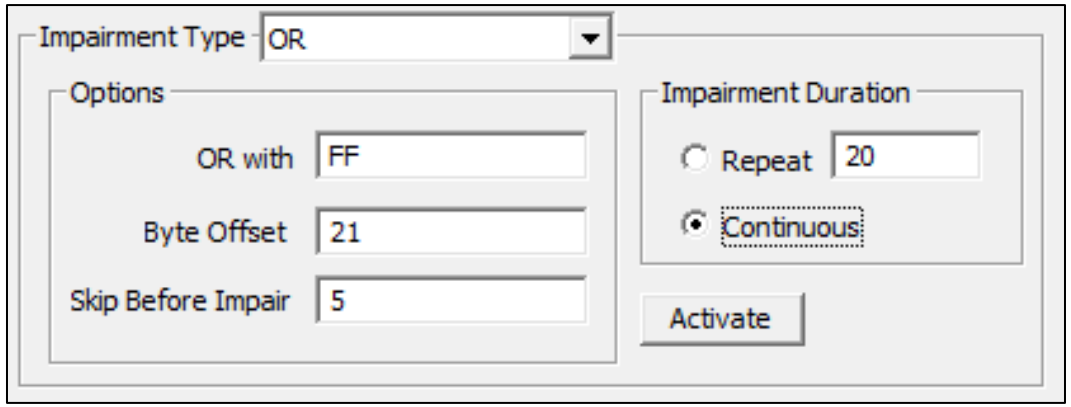
E.g.: 56th byte of every 17th frame being ANDed with 00 which will be repeated 20 times.



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.

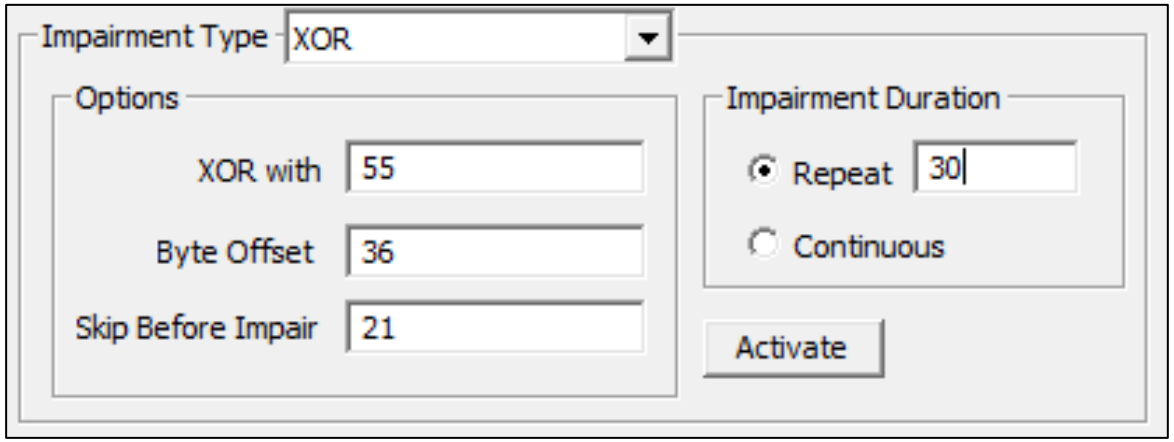


Impairments (Contd.)

Logical XOR

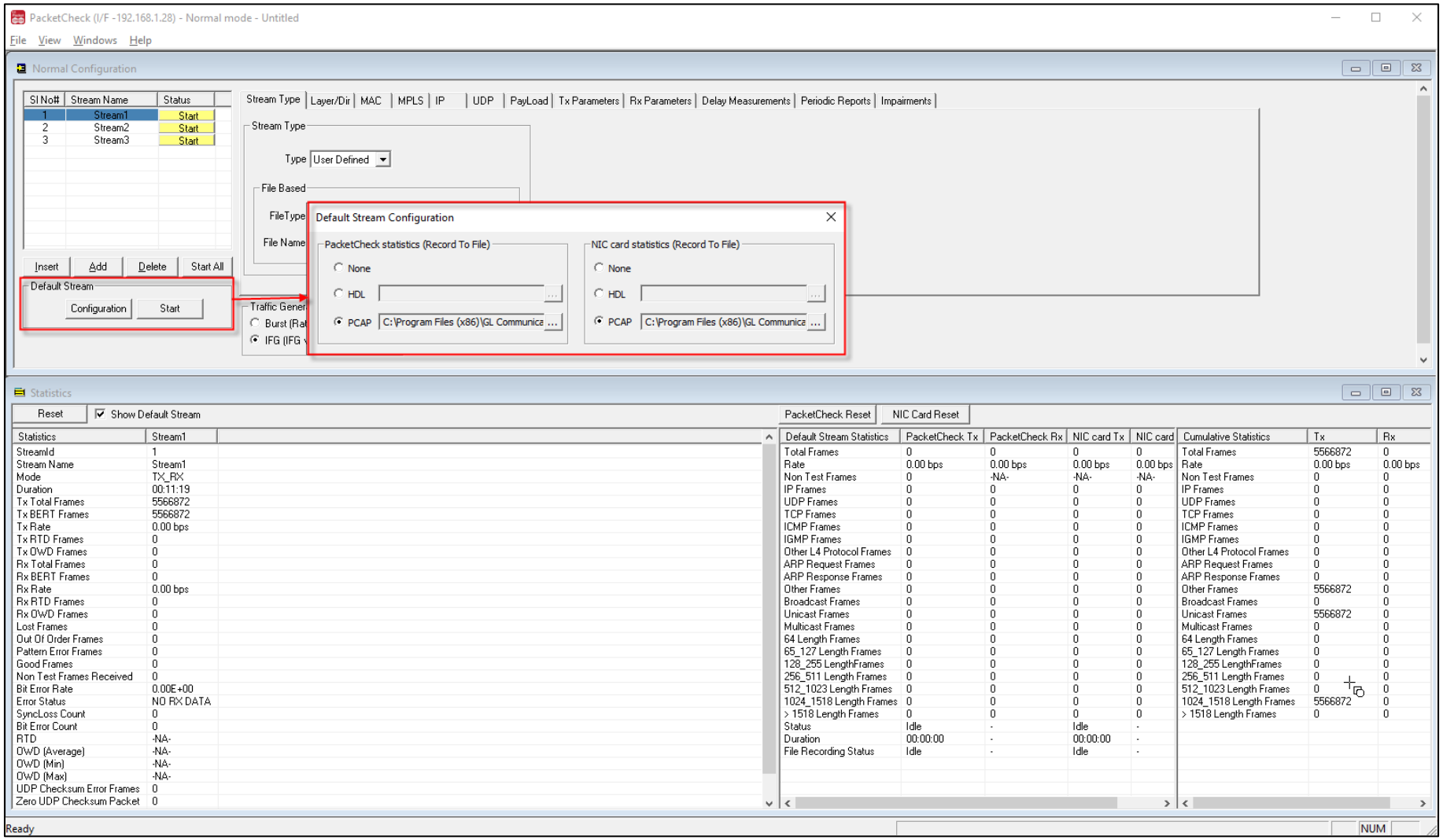
Modify a byte at specified offset for every ‘Y’ packets sent out for the stream. Modification is done by doing logical XOR with the user specified Hex byte. Repeat this for limited number of times or repeat continuously.

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

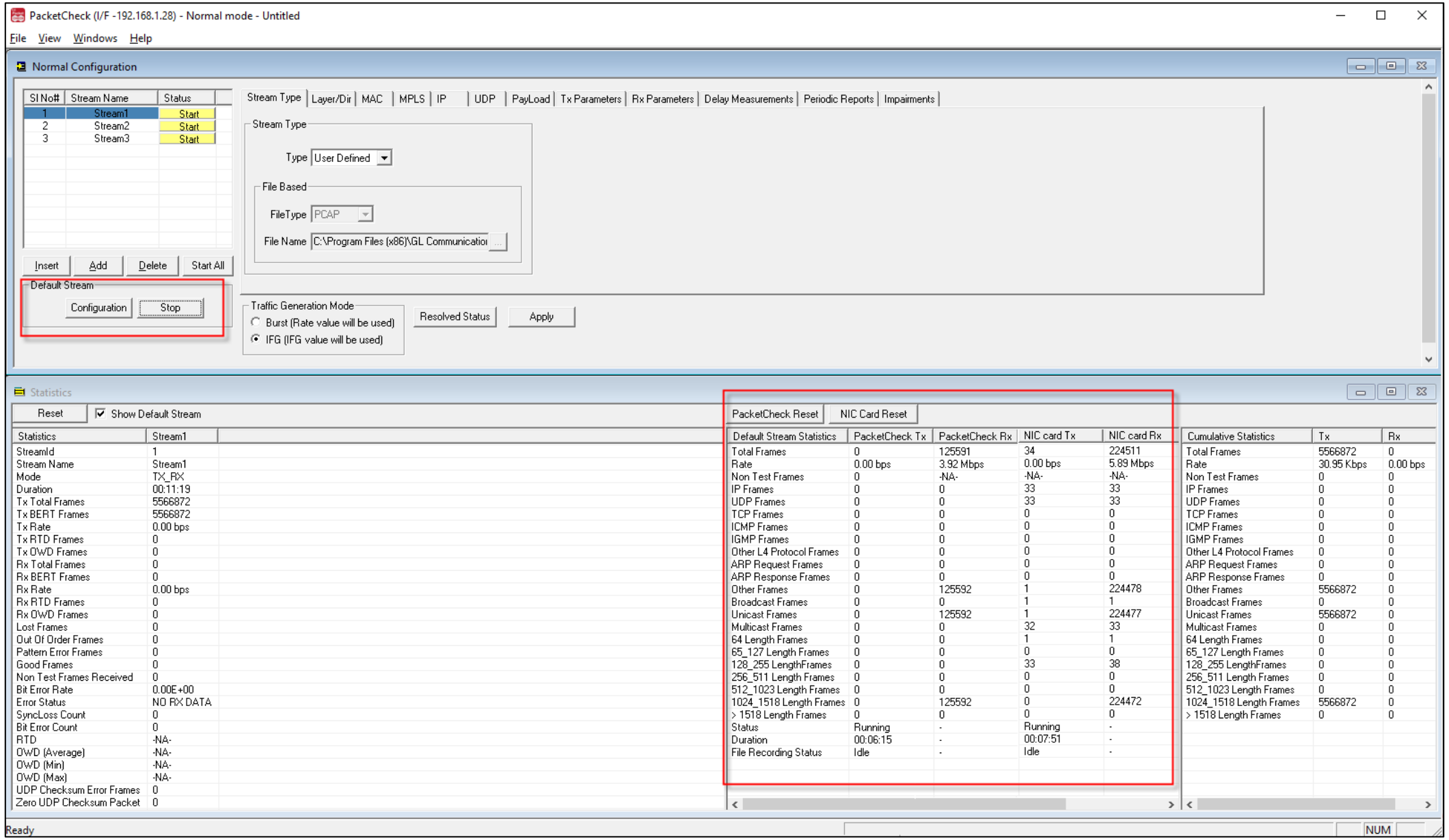


Default Stream Configuration

- All incoming Ethernet frames not belonging to any of the user defined streams are treated as default stream

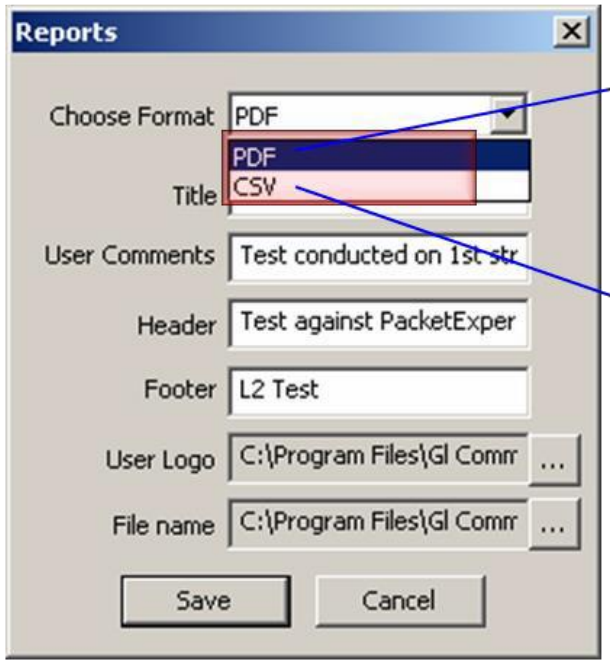


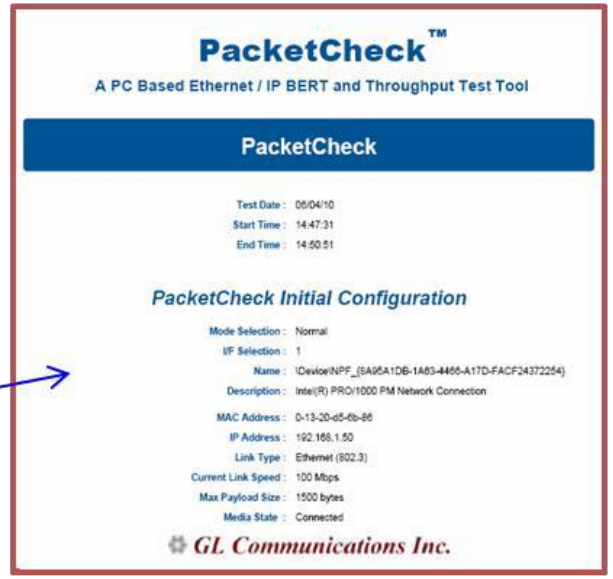
Default Stream Statistics

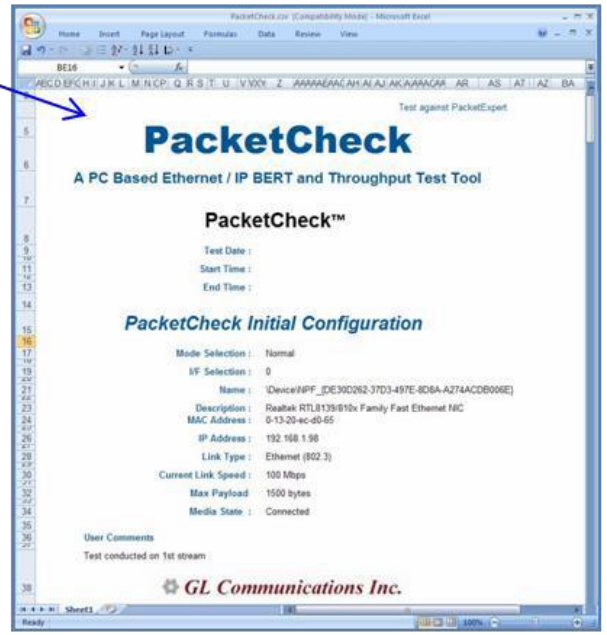


Report Generation

(*.pdf, *. csv file formats)







Thank you!