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# PacketCheck™ – Software Ethernet Tester

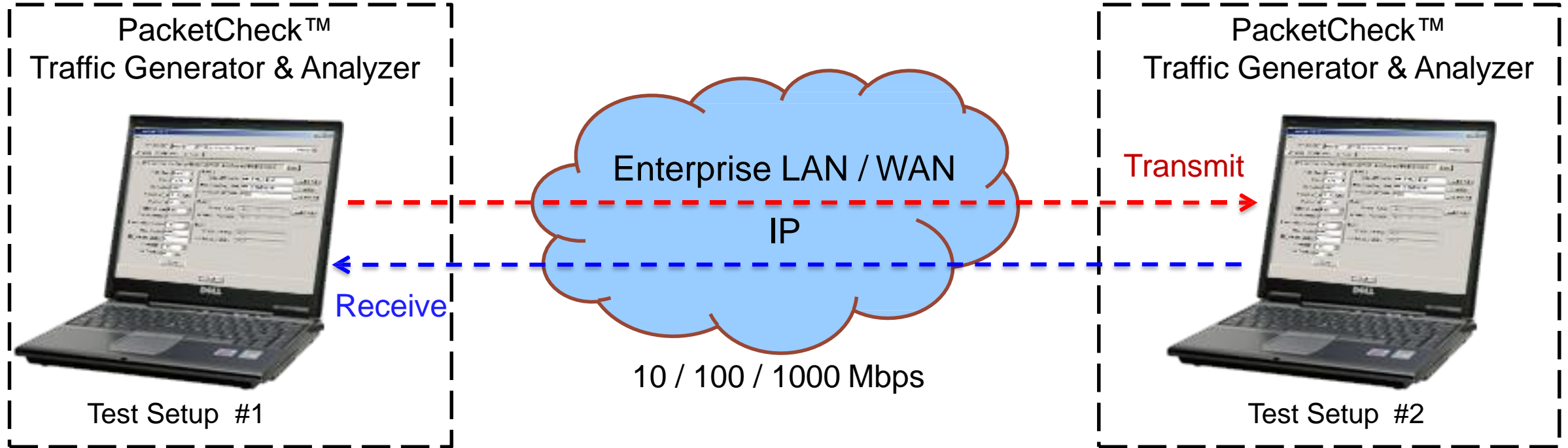
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# PacketCheck™- Ethernet / IP Test Tool

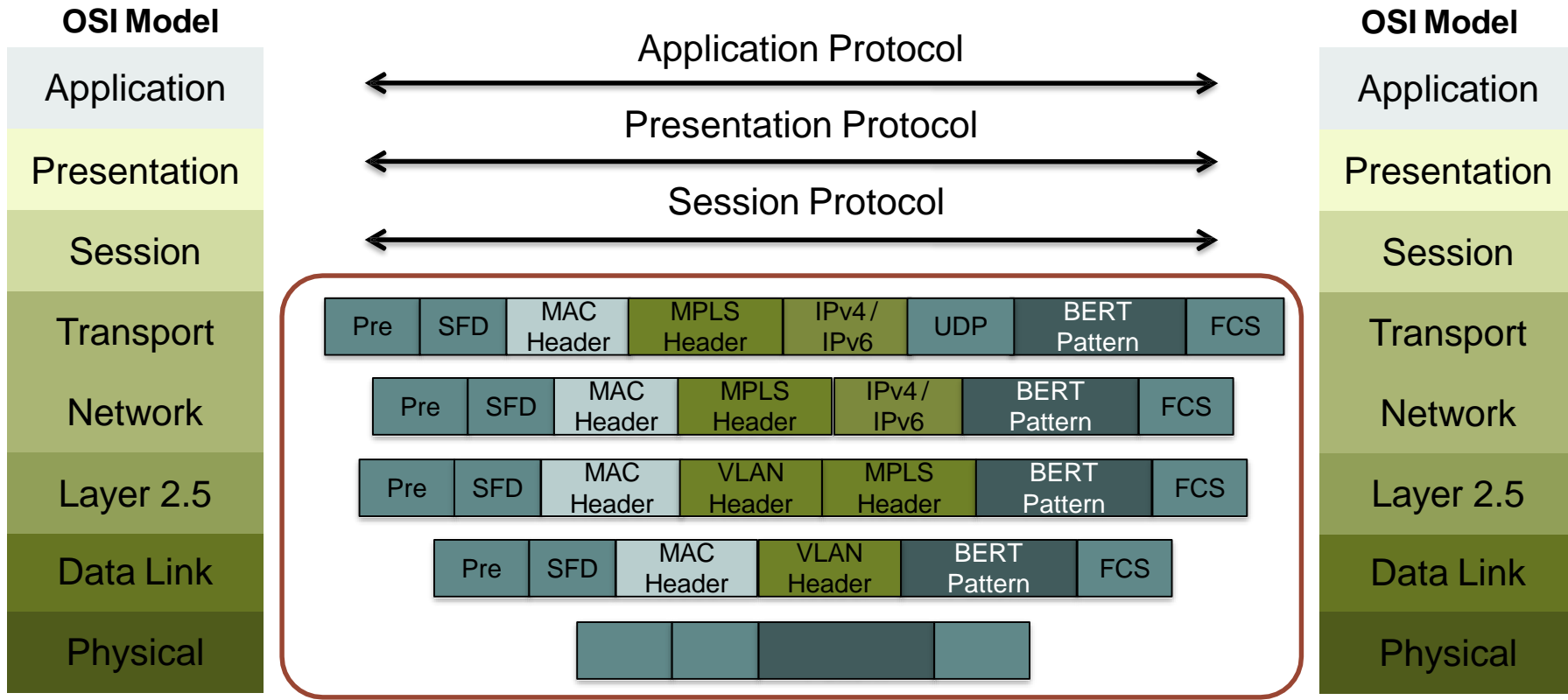


- PacketCheck™ uses the PC's network interface card to transmit and receive Ethernet or IP packets
- Bit Error Rates (BER) and throughputs up to 800 Mbps can be easily tested
- Generates multi-stream Ethernet / IP / UDP traffic as well single-stream physical layer traffic
- Measures end to end performance such as bit error rate, total packets, packet loss, out of sequence packets, and errored packets

# 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?
- Need to test network behavior with real world traffic like IPTV, VoIP?

# 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
  - Ether Length/Type – 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

# Main Features

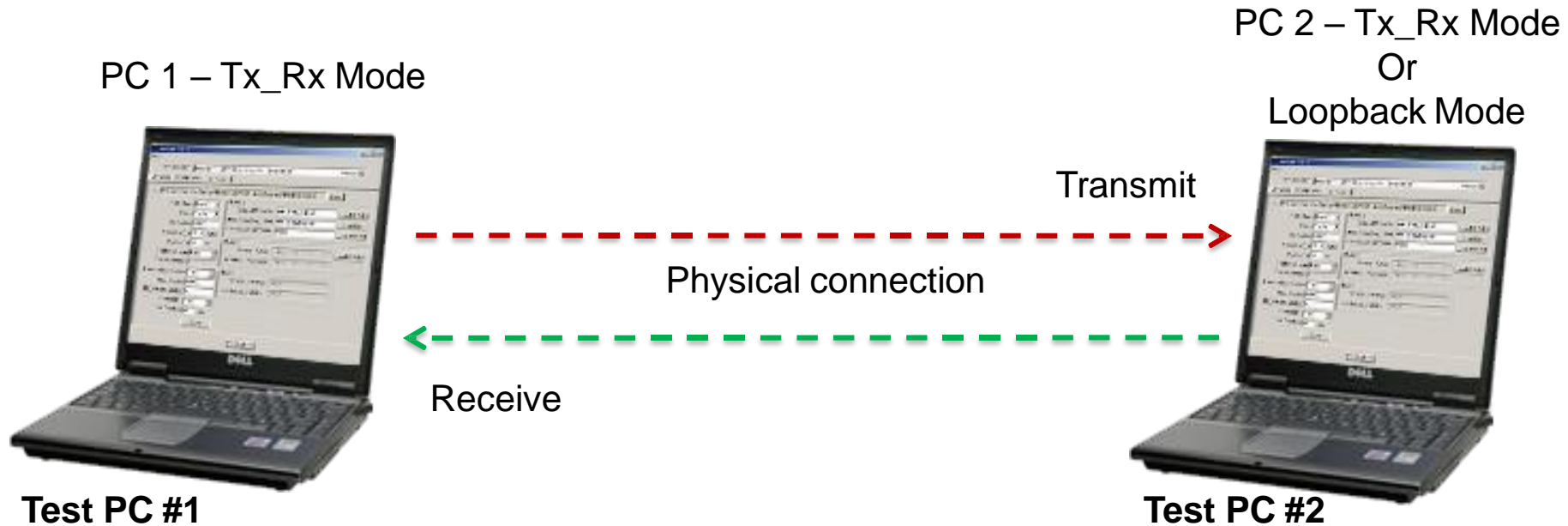
- Test Ethernet traffic of up to 500 Mbps bandwidth
- Generate full duplex IP, UDP, or Ethernet frame traffic on any of the four layers (Physical / Data Link / Network / Transport) with on-demand bandwidth
- Generate multiple streams with different parameters. Measures statistics on each stream
- Generate 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
- Customizable protocol headers like MAC source / destination address, length / type field, IP source / destination address, and UDP source / destination port
- Create 100+ 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

# Main Features (Contd..)

- 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 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
- 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
- Measure one-way or roundtrip delay automatically

# BER Test Setup at Layer 1

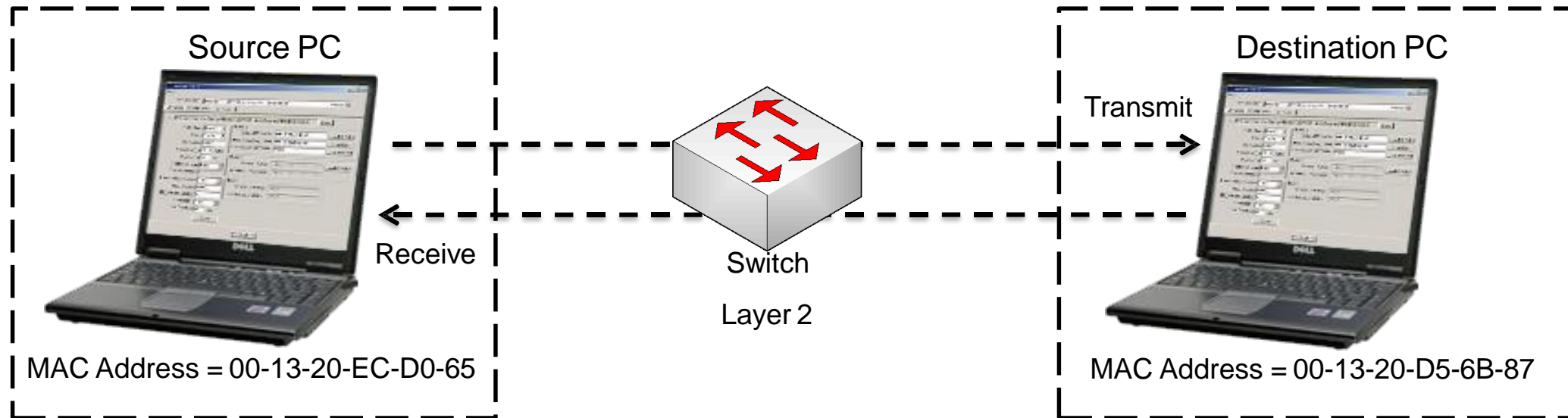
**Scenario 1: Source & destination PCs connected using Ethernet cable**



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

# BER Test Setup at Layer 2

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

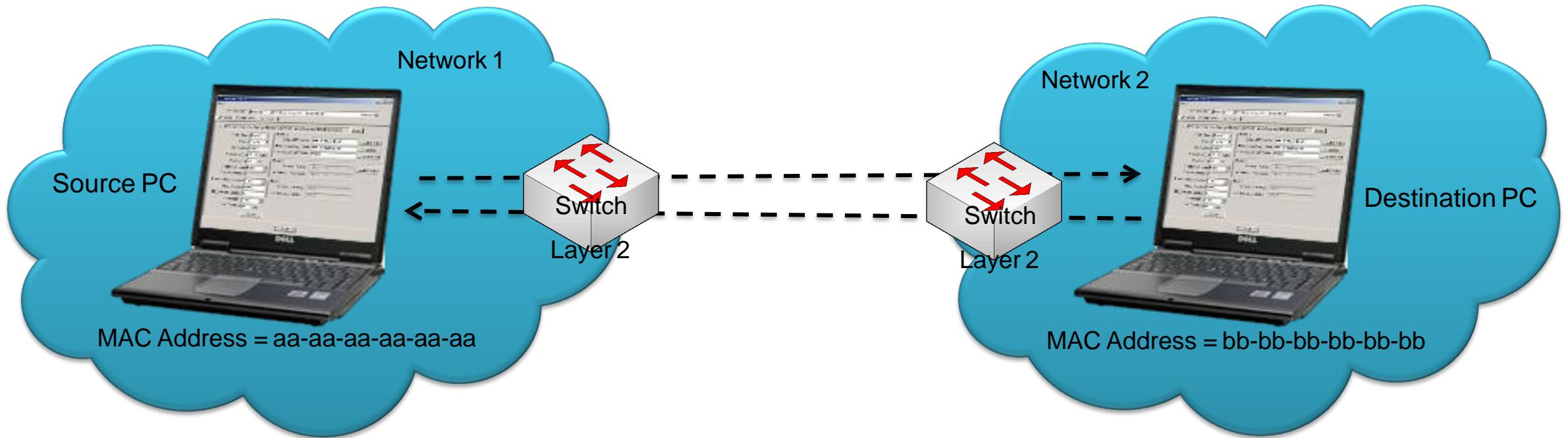


The PCs are connected through a switch, which routes the packets based on the MAC address.



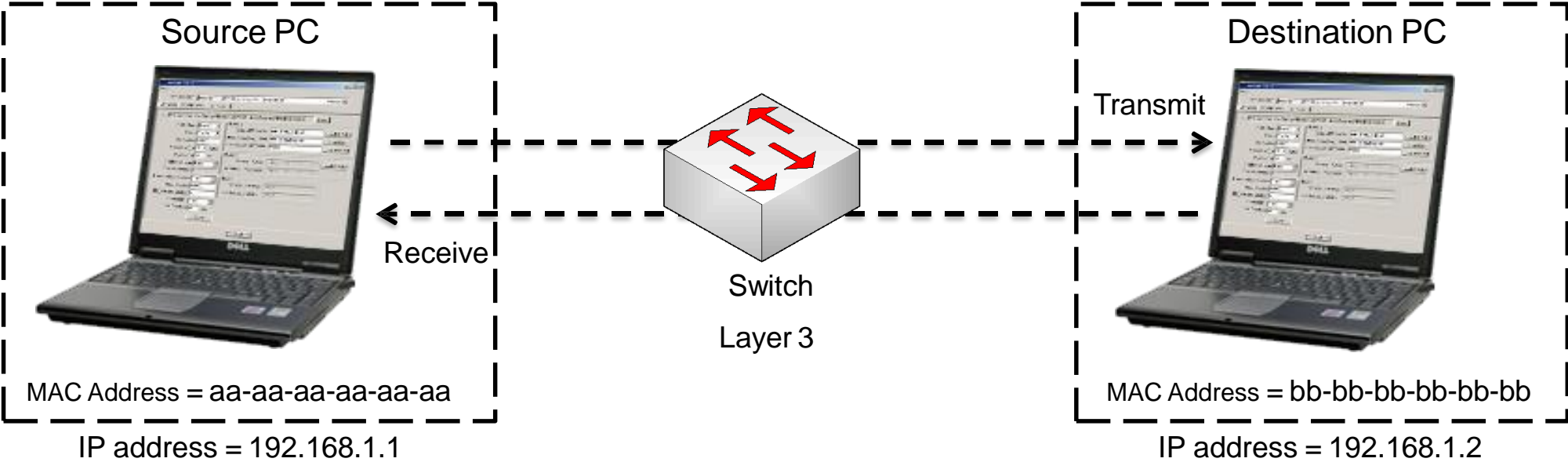
# BER Test Setup at Layer 2

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



# BER Test Setup at Layer 3 / 4

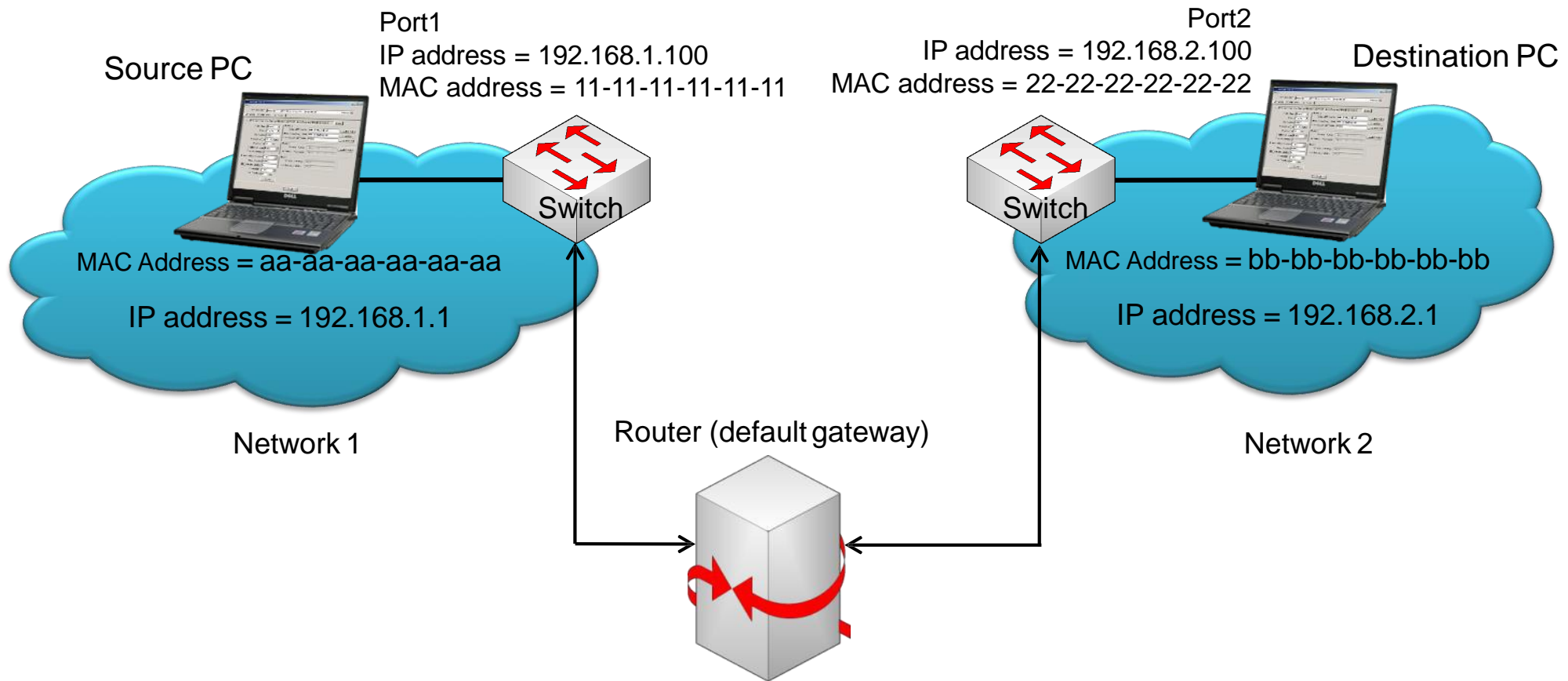
**Scenario 4: Source & destination PCs are located within the same IP Network**



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 & 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

The screenshot shows a window titled "PacketCheck - Initial config" with a standard Windows title bar. The window contains the following elements:

- Mode Selection:** A group box containing two radio buttons: "Normal" (which is selected) and "Loopback".
- I/F Selection:** A dropdown menu showing "Intel(R) Ethernet Connection I217-V [192.168.1.23]".
- Start Packet Check:** A button located below the I/F Selection dropdown.
- Configuration Fields:** A series of text boxes for the following parameters:
  - Name: \Device\NPF\_{C0469574-F48E-4698-97DF-B237037F1F9A}
  - Description: Intel(R) Ethernet Connection I217-V
  - MAC Address: fc-aa-14-9c-fa-b9
  - IP Address: 192.168.1.23
  - Link Type: Ethernet (802.3)
  - Current Link Speed: 1000 Mbps
  - Max Payload Size: 1500 bytes
  - Media State: Connected

# Layer 1 Single-stream Generation

The screenshot displays the PacketCheck software interface. The top window, titled "Normal Configuration", shows a table with one stream named "stream1" in a "Stop" state. A red box highlights this row, with an arrow pointing to the text "Single Stream Selection". To the right, the "Layer" configuration is shown with Layer 2 set to "Ethernet" and Layers 2.5, 3, and 4 set to "None". A red bracket groups these three layers with the text "Layer 2.5, 3, 4 is set to None". Below the configuration, the "Traffic Generation Mode" is set to "IFG (IFG value will be used)" and "Traffic Reception Mode" is set to "Bridge".

The bottom window, titled "Statistics", shows a table of statistics for "stream1". A red box highlights the "Statistic" column, with an arrow pointing to the text "Test Statistics". To the right, a "Common Statistic" table is displayed.

Statistic	stream1
StreamId	1
Stream Name	stream1
Mode	TX_RX
Duration	00:01:41
Tx Frames	5053
Tx Rate	603.38 Kbps
Rx Frames	5053
Rx Rate	603.37 Kbps
Lost Frames	0
Out Of Order Frames	0
Pattern Error Frames	0
Good Frames	0
Non Test Frames Received	0
Bit Error Rate	0.00E+00
Error Status	SYNC
SyncLoss Count	0
Bit Error Count	0
RTD	-NA-
OWD	-NA-
UDP Checksum Error Frames	0
Zero UDP Checksum Packet	0

Common Statistic	Values
Tx Frames	0
Tx Rate	0.00 bps
Rx Frames	7646
Rx Rate	749.58 Kbps
Rx Non Test Frames	1919
Rx Broadcast Frames	849
Rx Unicast Frames	6797
Rx IP Frames	1682
Rx UDP Frames	931
Rx ICMP Frames	3
Rx ARP Frames	674
Rx 64 Length Frames	1049
Rx 65-127 Length Frames	691
Rx 128-511 Length Frames	721
Rx 512-1023 Length Frames	52
Rx 1024-1518 Length Frames	5116
Rest of the Frames	17
Rx Dropped Frames	0

# Layer 2 / 3 / 4 Multi-stream Generation

PacketCheck (I/F - 192.168.1.23) - Normal mode - Test\_4\_Streams

File View Windows Help

### Normal Configuration

SI No#	Stream Name	Status
1	Stream 1	Stop
2	Stream 2	Stop
3	Stream 3	Stop
4	Stream 4	Stop

Multi-stream BER Testing

Layer/Dir: MAC | MPLS | IP | UDP | PayLoad | Tx Parameters | Rx Parameters | Delay Measurements | Periodic Reports | Impairments

Layer Dir: Tx\_Rx

Layer 2: Ethernet

Layer 2.5: None

Layer 3: IP

Layer 4: UDP

Traffic Generation Mode:  Burst (Rate value will be used)  IFG (IFG value will be used) NOTE: If any stream is configured for HDL payload, Mode will be forced to IFG

Traffic Reception Mode:  Bridge  Route

Resolved Status

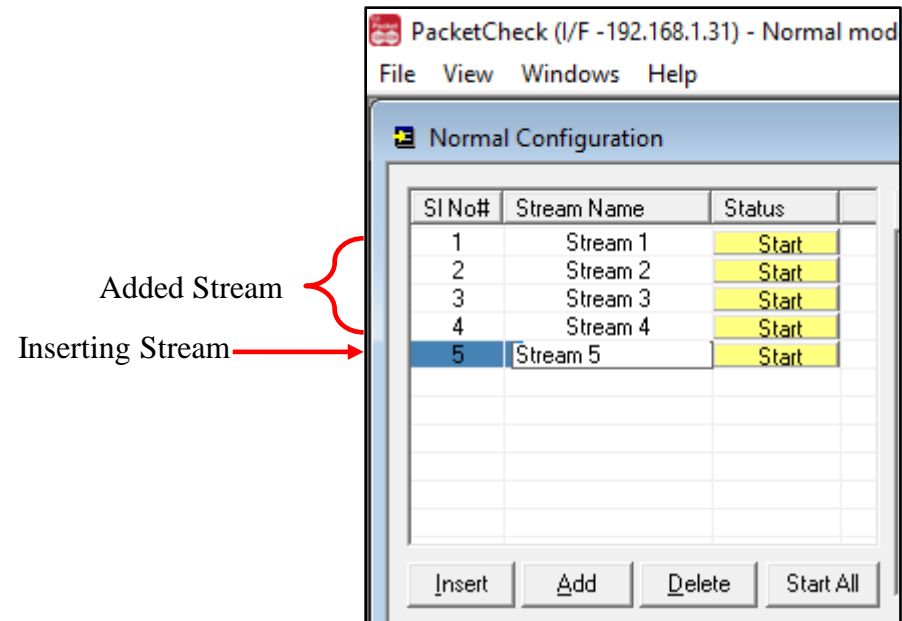
### Statistics

Reset

Statistic	1	2	3	4	Common Statistic	Values
StreamId	1	2	3	4	Tx Frames	1511
Stream Name	Stream 1	Stream 2	Stream 3	Stream 4	Tx Rate	0.00 bps
Mode	TX_RX	TX_RX	TX_RX	TX_RX	Rx Frames	58280
Duration	00:00:18	00:00:17	00:00:17	00:00:16	Rx Rate	41.25 Mbps
Tx Frames	15922	14925	14426	14066	Rx Non Test Frames	349
Tx Rate	10.41 Mbps	10.44 Mbps	10.39 Mbps	10.44 Mbps	Rx Broadcast Frames	125
Rx Frames	14925	14835	14063	13996	Rx Unicast Frames	58155
Rx Rate	10.44 Mbps	10.41 Mbps	10.43 Mbps	10.38 Mbps	Rx IP Frames	58062
Lost Frames	0	0	0	0	Rx UDP Frames	57987
Out Of Order Frames	0	0	0	0	Rx ICMP Frames	19
Pattern Error Frames	0	0	0	0	Rx ARP Frames	112
Good Frames	0	0	0	0	Rx 64 Length Frames	153
Non Test Frames Received	0	0	0	0	Rx 65-127 Length Frames	196
Bit Error Rate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Rx 128-511 Length Frames	92
Error Status	SYNC	SYNC	SYNC	SYNC	Rx 512-1023 Length Frames	20
SyncLoss Count	0	0	0	0	Rx 1024-1518 Length Frames	57819
Bit Error Count	0	0	0	0	Rest of the Frames	0
RTD	-NA-	-NA-	-NA-	-NA-	Rx Dropped Frames	0
QwD	-NA-	-NA-	-NA-	-NA-		
UDP Checksum Error Frames	0	0	0	0		
Zero UDP Checksum Packet	0	0	0	0		

Ready

# 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

# MAC / IP / UDP Configurations

Layer

Dir Tx Rx

Layer 2 Ethernet

Layer 2.5 MPLS

Layer 3 IP

Layer 4 UDP

Layer/Dir MAC MPLS IP UDP Payload Tx Parameters

Layer 2

Source MAC Addr FC-AA-14-92-AA-D7 Use I/F Addr

Destination MAC Addr F4-EE-08-0E-09-BB Resolve

Len/Type Field Value 00-00 User defined

Layer/Dir MAC MPLS IP UDP Payload Tx Parameters Rx Parameters Delay Measurements Periodic Reports Impairments

MPLS Stack 3

MPLS #1

Label 564564 CoS 1 TTL 128

MPLS #2

Label 768768 CoS 5 TTL 128

MPLS #3

Label 434534 CoS 7 TTL 128

Layer/Dir MAC MPLS IP UDP Payload Tx Parameters Rx Parameters Delay Measurements Periodic Reports Impairments

Source

Source IP Address 192 . 168 . 1 . 31 Use I/F Address

Subnet Mask 255 . 255 . 255 . 0

Destination

Destination IP address 192 . 168 . 1 . 50 Ping

Default Gateway 0 . 0 . 0 . 0 Enable

Increment Identification

Initial Value 0

IP Spoofing

Enable Start 0 End 0

TOS/DS 00 TTL 128 Protocol 17

Build MAC Header Automatically

Layer/Dir MAC MPLS IP UDP

Source Port 40000

Destination Port 50000

Configure Checksum 00 00



# Payload

Layer/Dir | MAC | MPLS | IP | UDP | Payload | Tx Parameters | Rx Parameters | Delay Measurements | Periodic Reports | Impairments

Source

Source Type: Fixed Pattern  
Fixed Pattern: AB CD E F

PRBS Pattern: QRSS

Invert Pattern

HDL File: C:\Program Files\...

Enable Sequence Number  
 Up Count  
 Up and Down Count

Enable Magic Pattern  
7a-39-68-47-34-62-4b-5f-47-4c-00-00-00-00 Default

## 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  $2^{23}-1$
- HDL File – transmit HDL frames through a file. PacketCheck™ measures and reports the bit error rate, error status and the sync loss count based on the PRBS reception

Layer/Dir | MAC | MPLS | IP | UDP | Payload | Tx Parameters | Rx Parameters | Delay Measurements | Periodic Reports | Impairments

Source

Source Type: PRBS Pattern  
Fixed Pattern: 00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00

PRBS Pattern: QRSS

Invert Pattern

HDL File: ...

Enable Sequence Number  
 Up Count  
 Up and Down Count

Enable Magic Pattern  
7a-39-68-47-34-62-4b-5f-47-4c-00-00-00-00 Default

Layer/Dir | MAC | MPLS | IP | UDP | Payload | Tx Parameters | Rx Parameters | Delay Measurements | Periodic Reports | Impairments

Source

Source Type: HDL File  
Fixed Pattern: 00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00

PRBS Pattern: QRSS

Invert Pattern

HDL File: C:\Program Files\...

Enable Sequence Number  
 Up Count  
 Up and Down Count

Enable Magic Pattern  
7a-39-68-47-34-62-4b-5f-47-4c-00-00-00-00 Default

# Tx and Rx Parameters

Layer/Dir | MAC | MPLS | IP | UDP | Payload | **Tx Parameters** | Rx Parameters | Delay Measurements | Periodic Reports | Impairments

Frame Size  
 Fixed Size  
 Random (Min-Max)  Increasing  
 Decreasing  
 Statistical Distribution  
Min  Max   
Min Frame Len  Max Frame Len

Stop Condition  
 Continuous  
 EOF  
 Duration  sec  
 N No of Frames

Rate  %  
IFG  msec  Take From HDL File

Achievable Rate  
Fixed  
Frame Size   
Rate (Kbps)

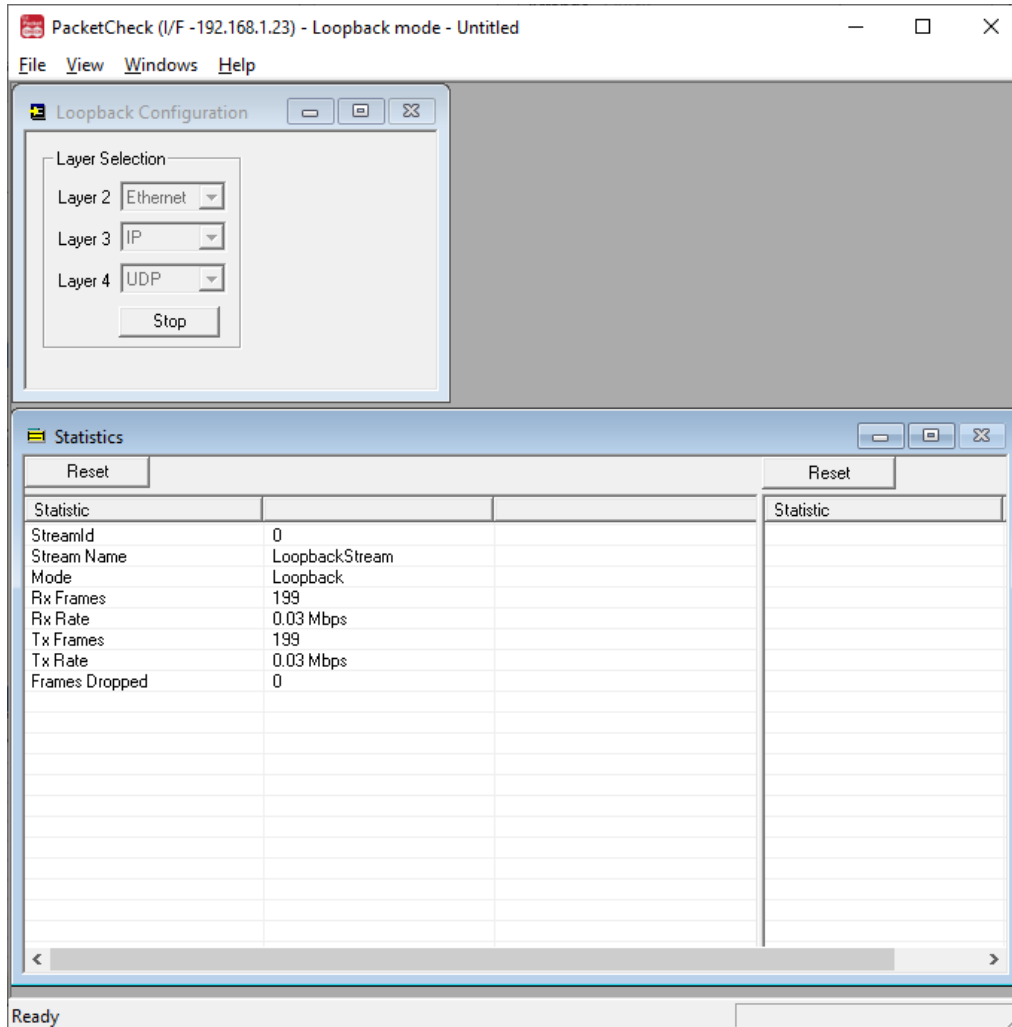
Layer/Dir | MAC | MPLS | IP | UDP | Payload | Tx Parameters | **Rx Parameters** | Delay Measurements | Periodic Reports | Impairments

Record To Binary File  ...  
 Record To HDL File  ...  
 Generate Bert Log  ...

Stop Condition  
 Continuous  
 Duration  sec  
 N No of Frames

- 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 format), and BERT log files
- Stop conditions to limit the fixed / PBRS pattern file transmission and logging of the received patterns to a defined file

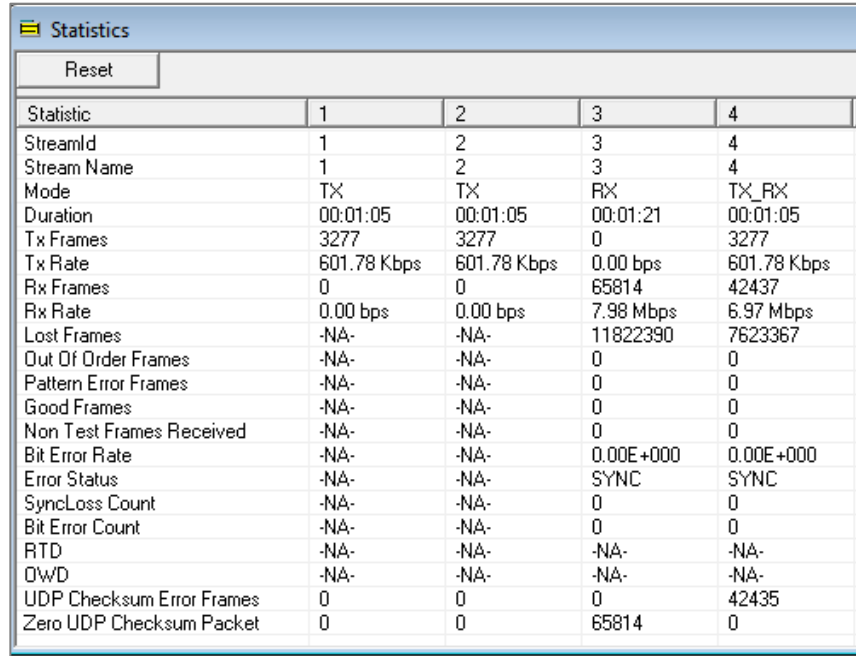
# Loopback Mode



- PacketCheck™ can operate in Loopback mode. PacketCheck™ can perform loopback at the Ethernet, IP and UDP levels.

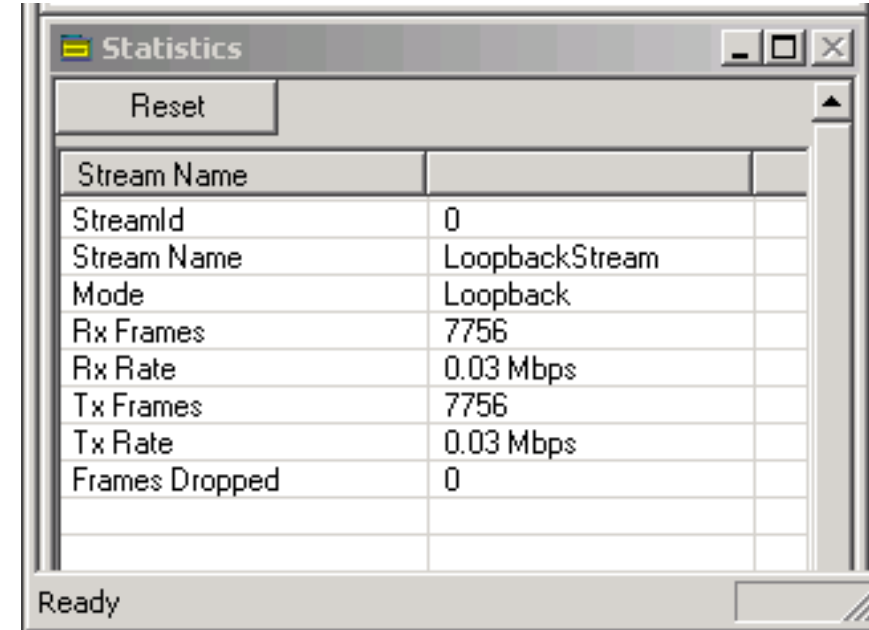
# Statistics

## Normal Mode



Statistic	1	2	3	4
StreamId	1	2	3	4
Stream Name	1	2	3	4
Mode	TX	TX	RX	TX_RX
Duration	00:01:05	00:01:05	00:01:21	00:01:05
Tx Frames	3277	3277	0	3277
Tx Rate	601.78 Kbps	601.78 Kbps	0.00 bps	601.78 Kbps
Rx Frames	0	0	65814	42437
Rx Rate	0.00 bps	0.00 bps	7.98 Mbps	6.97 Mbps
Lost Frames	-NA-	-NA-	11822390	7623367
Out Of Order Frames	-NA-	-NA-	0	0
Pattern Error Frames	-NA-	-NA-	0	0
Good Frames	-NA-	-NA-	0	0
Non Test Frames Received	-NA-	-NA-	0	0
Bit Error Rate	-NA-	-NA-	0.00E+000	0.00E+000
Error Status	-NA-	-NA-	SYNC	SYNC
SyncLoss Count	-NA-	-NA-	0	0
Bit Error Count	-NA-	-NA-	0	0
RTD	-NA-	-NA-	-NA-	-NA-
OWD	-NA-	-NA-	-NA-	-NA-
UDP Checksum Error Frames	0	0	0	42435
Zero UDP Checksum Packet	0	0	65814	0

## Loopback Mode



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

- 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

# Delay Measurements

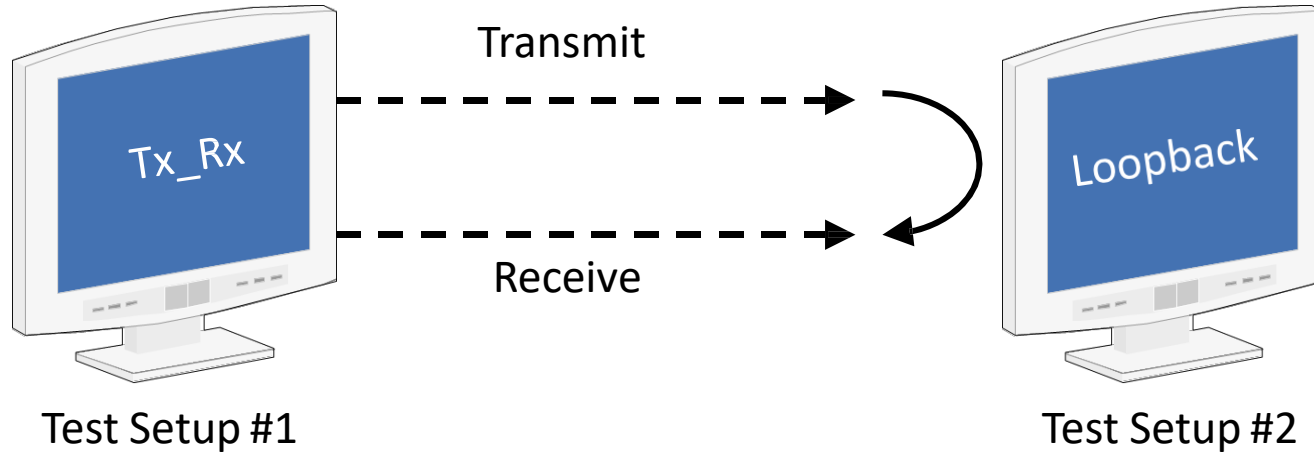
Layer/Dir | MAC | MPLS | IP | UDP | PayLoad | Tx Parameters | Rx Parameters | **Delay Measurements**

Measurement Type:  ▼

- None
- Round Trip Delay
- One Way Delay

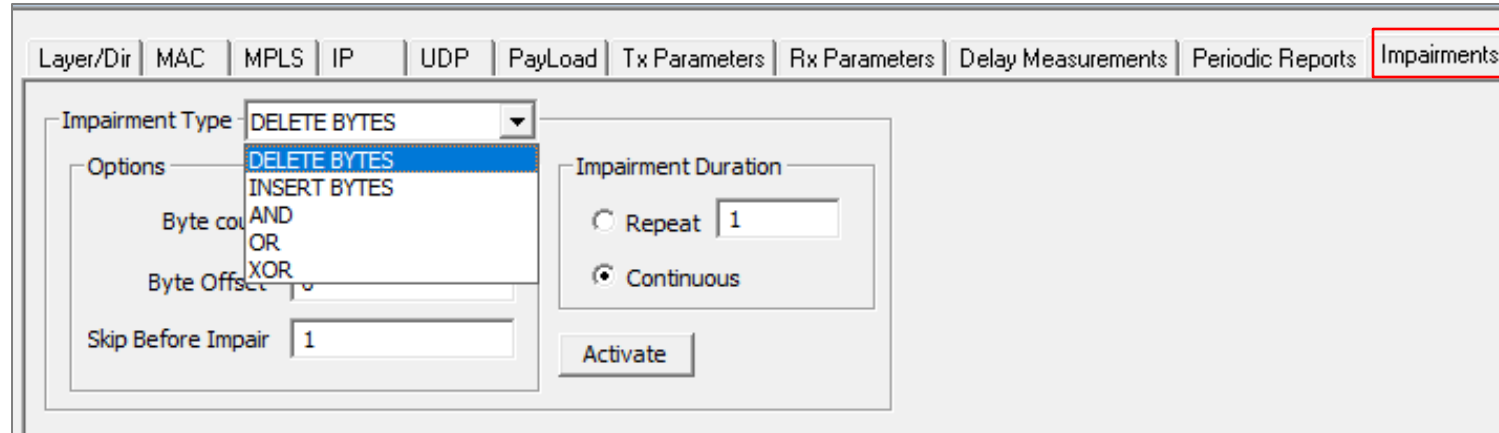
Enable RX

# 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.

# Run-time Impairment Generation



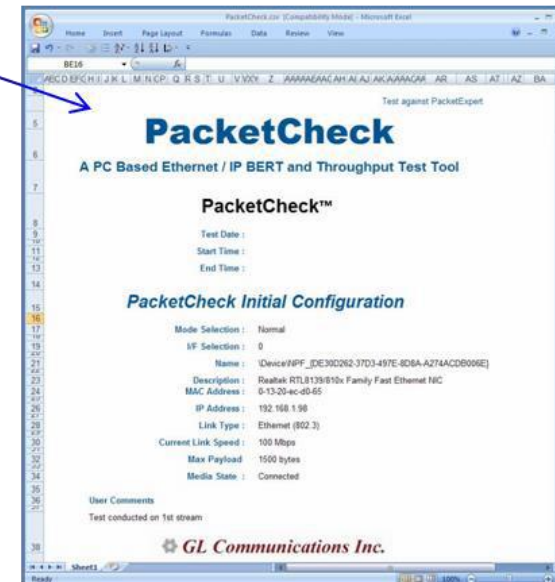
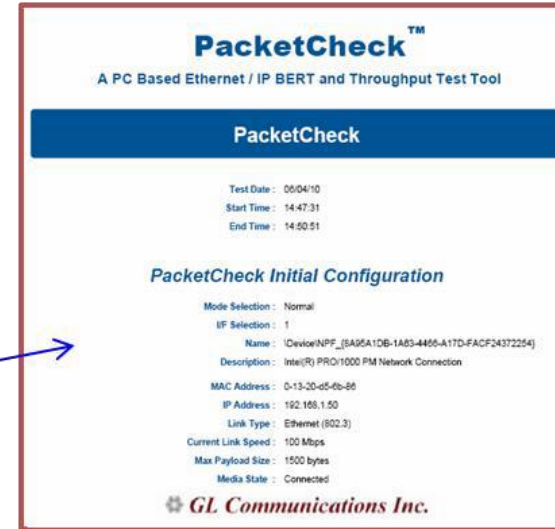
Impairments such as inserting, changing or deleting bytes can be introduced at run time.

# Report Generation

(\* .pdf, \* . csv file formats)

The Reports dialog box contains the following fields and options:

- Choose Format: PDF (selected)
- Title: PDF
- User Comments: Test conducted on 1st str
- Header: Test against PacketExper
- Footer: L2 Test
- User Logo: C:\Program Files\GL Commr ...
- File name: C:\Program Files\GL Commr ...
- Buttons: Save, Cancel





**Thank you!**