Multi-Link Frame Relay Emulator (MFR)

(FR and MFR Simulation)

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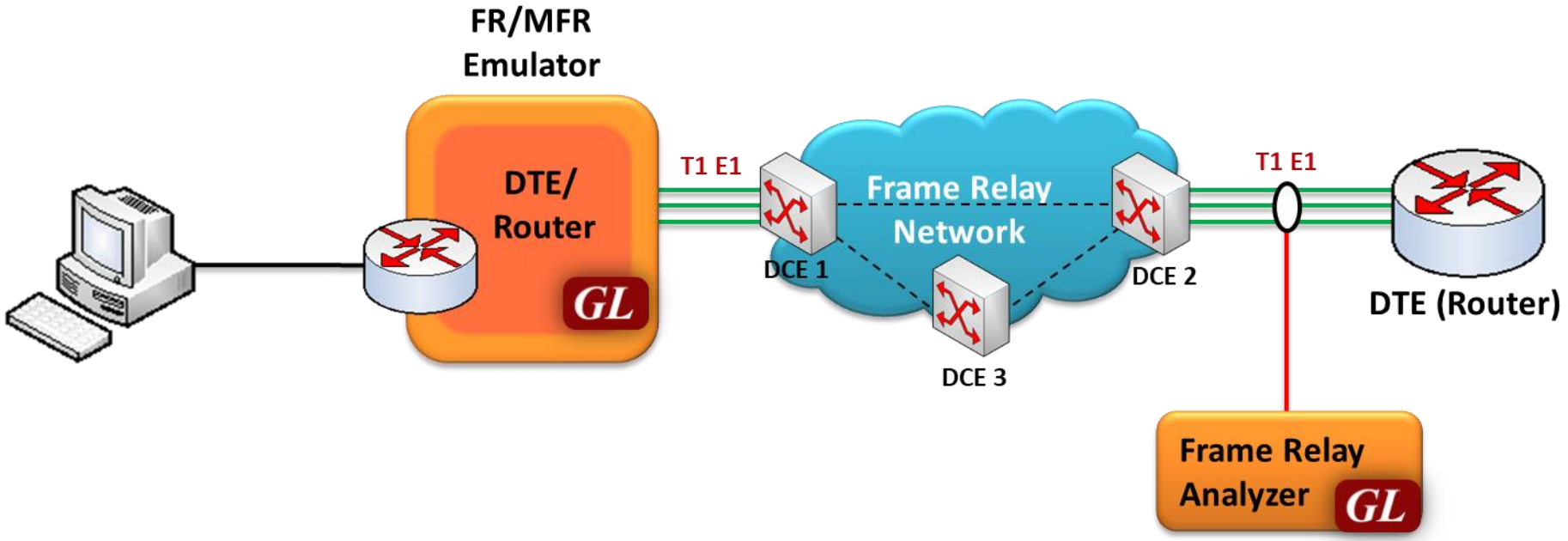
MFR Emulator Working Principle



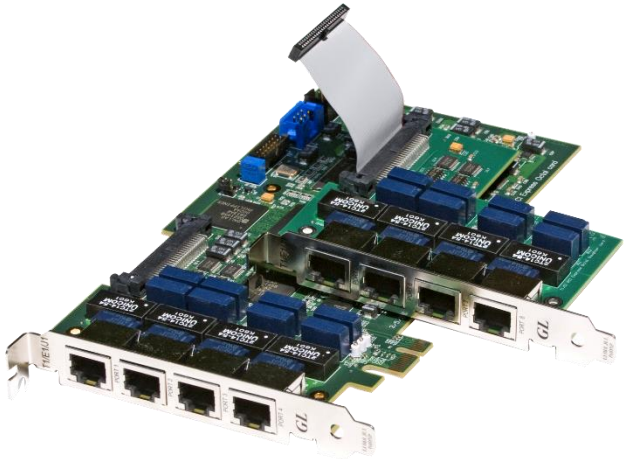
- Multi-Link Frame Relay Emulation (MFR) software based on client-server architecture over GL's field proven T1 E1 hardware platforms
- The software acts as a Frame Relay (FR)-MFR Data Terminal Equipment (DTE)/Router and generates traffic in compliance with frame relay fragmentation & reassembly models i.e., UNI (DTE-DCE) NNI (DCE peers) & end-to-end fragmentation over multiple virtual circuits

Hardware Platforms

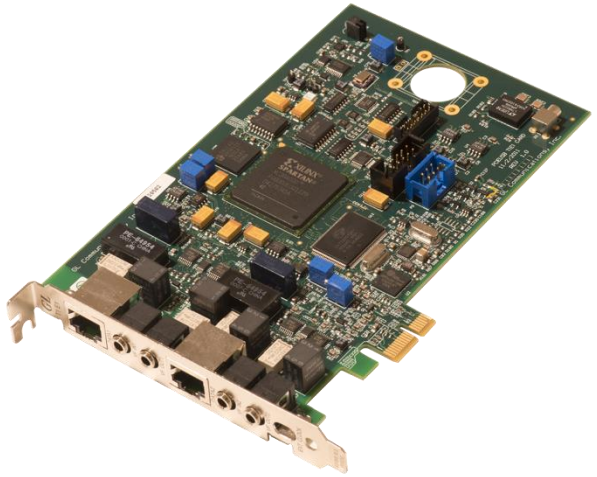
Back Panel

Front Panel

tProbe™ - Portable USB based T1 E1 VF FXO FXS and Serial Datacom Analyzer

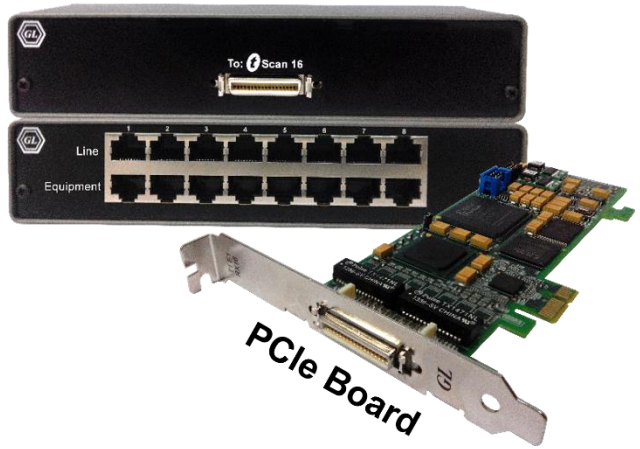


Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board

tScan16™ with
16-port T1 E1 Breakout Box



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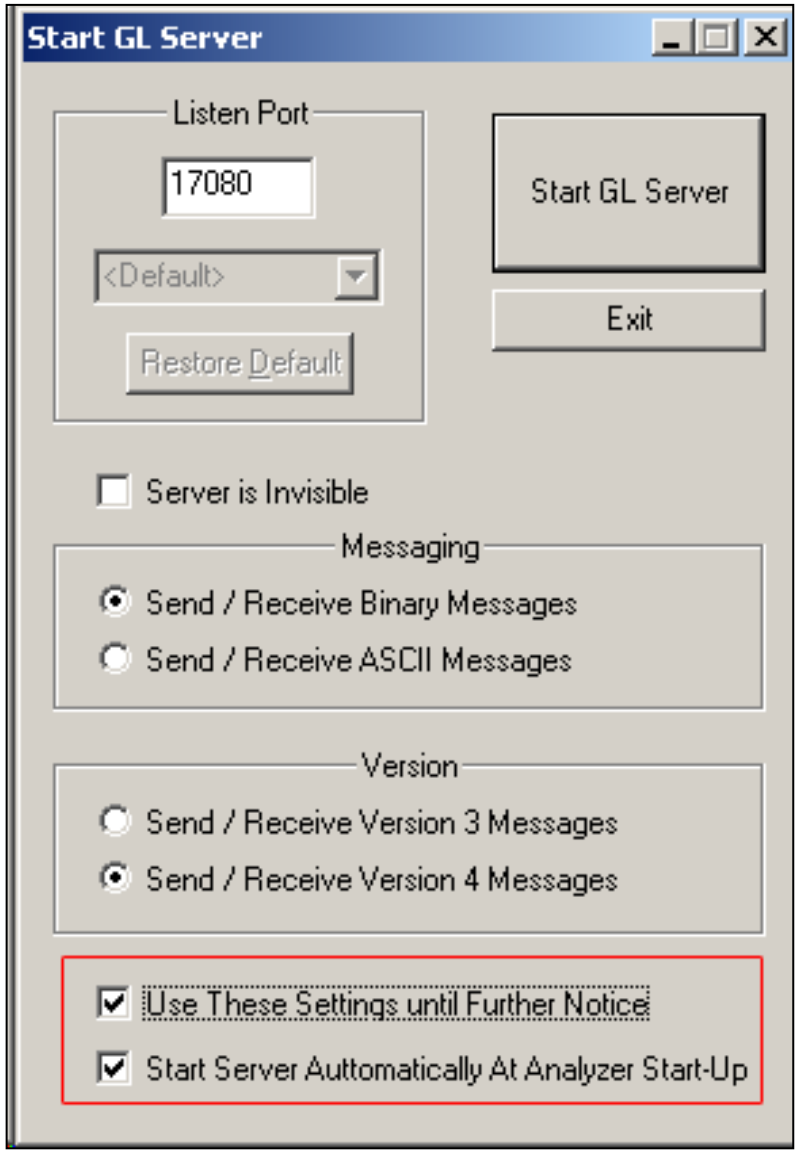
Connecting to the Server

- **Listen Port**: This is the TCP/IP port on which the server should listen for incoming connection requests from clients. By default, the Listen port for T1 card is set as **17080** and for E1, it is set as **17090**
- **Send / Receive Binary Messages**: Indicates that the server is to communicate with clients using binary messages
- **Send / Receive ASCII Messages**: Indicates that the server is to communicate with clients using ASCII (text-based) messages
- **Send / Receive Version 3 Messages**: Indicates that the server is to communicate with clients using version 3 messages
- **Send / Receive Version 4 Messages**: Indicates that the server is to communicate with clients using version 4 messages
- **Use these settings Until Further Notice**: This option to use the current configuration settings as default settings at analyzer startup
- **Start Server Automatically At analyzer Startup**: It will start the WCS server at analyzer startup by default



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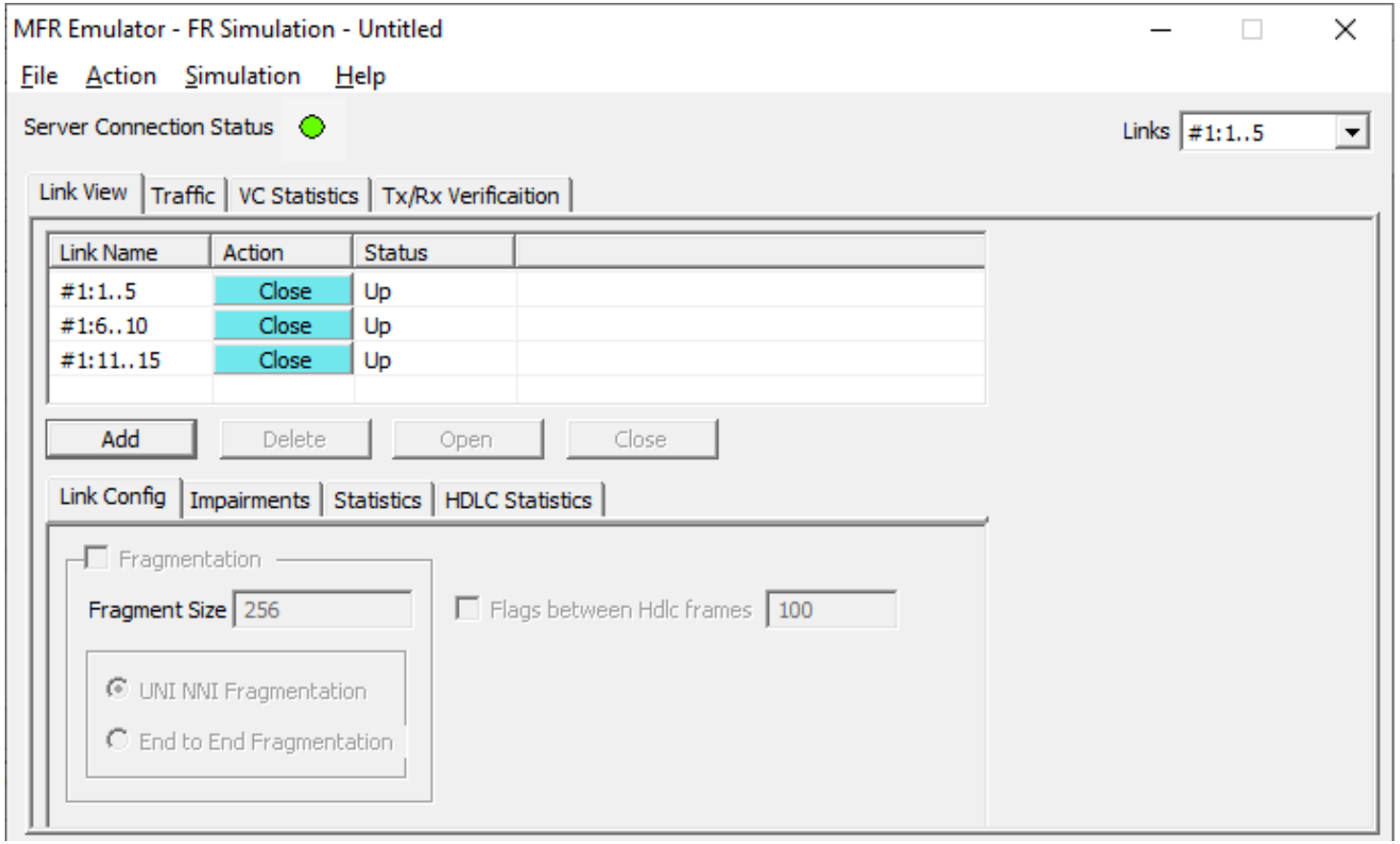
Simulating Frame Relay Links

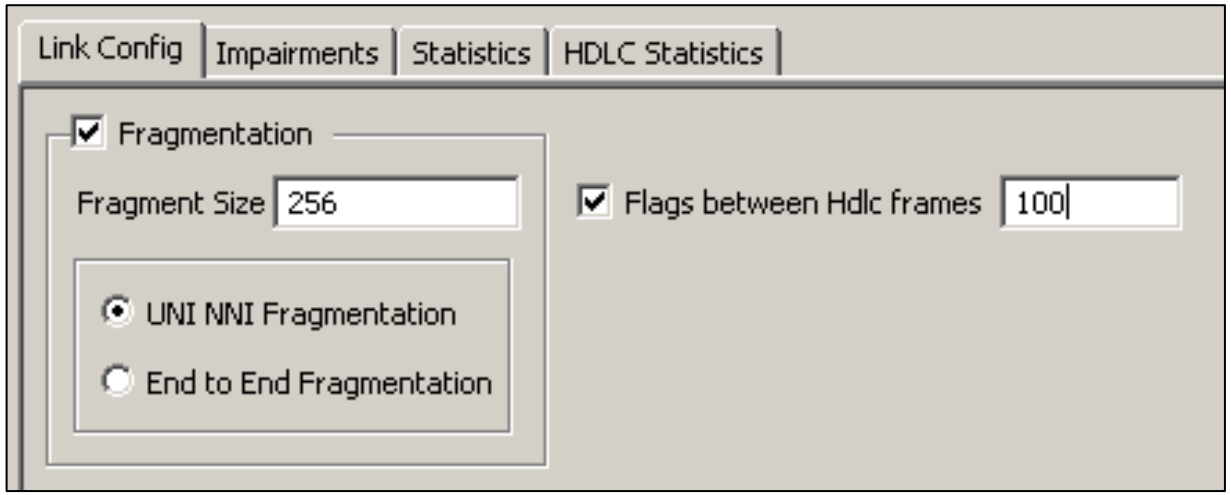
- Various links (of any bandwidth varying from 64Kbps to n*64Kpbs or sub channels) can be added in FR Simulation

- Two or more than two timeslots can be grouped to constitute a Hyper-channel



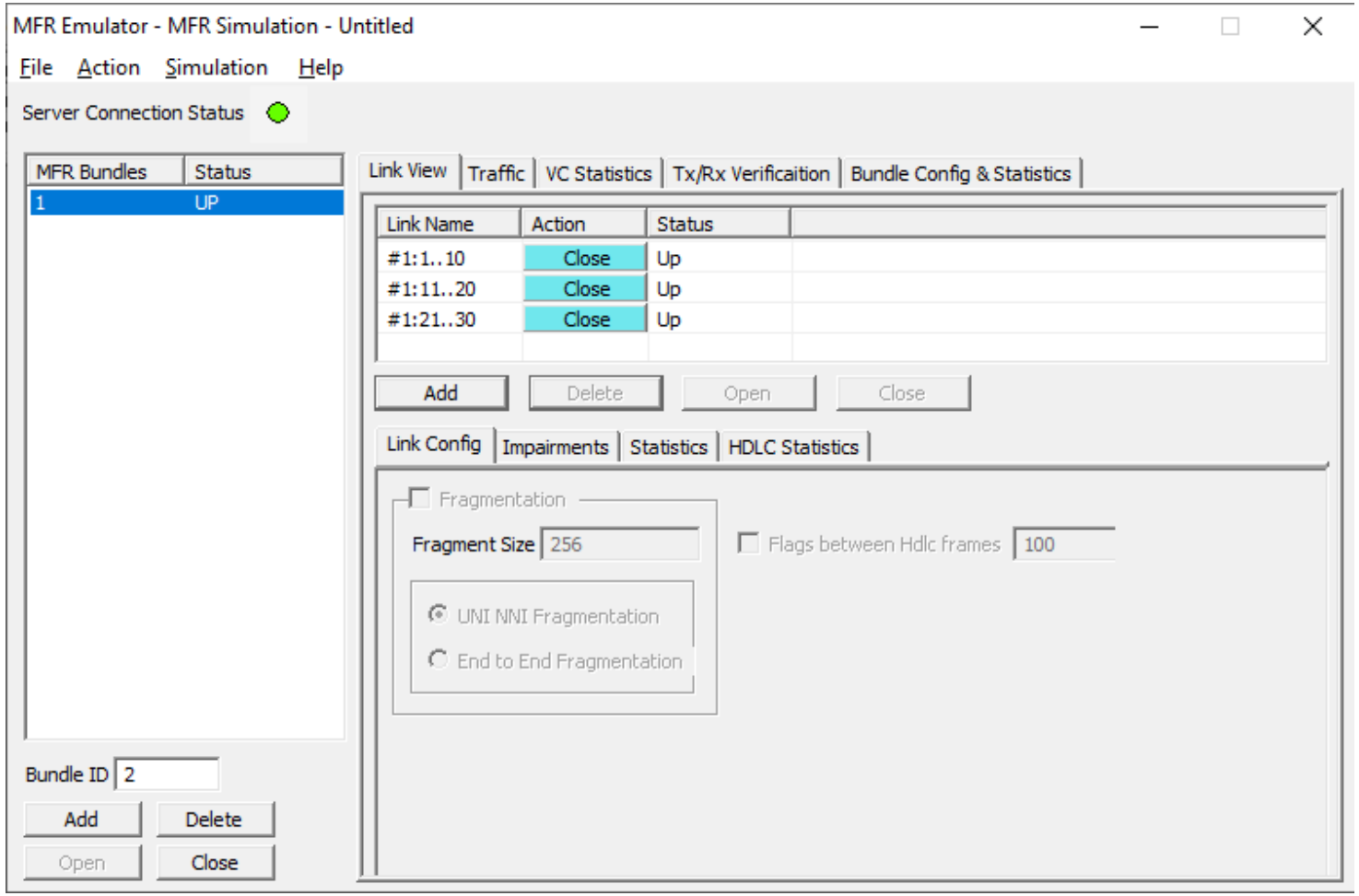
Link Configuration

- Provides Frame Fragmentation configuration adhering to FRF.12 standard for traffic generation on selected FR links
- Supports two types of fragmentation: UNI NNI Fragmentation and End-to-End Fragmentation on a FR link
- Allows to configure the bandwidth using flags



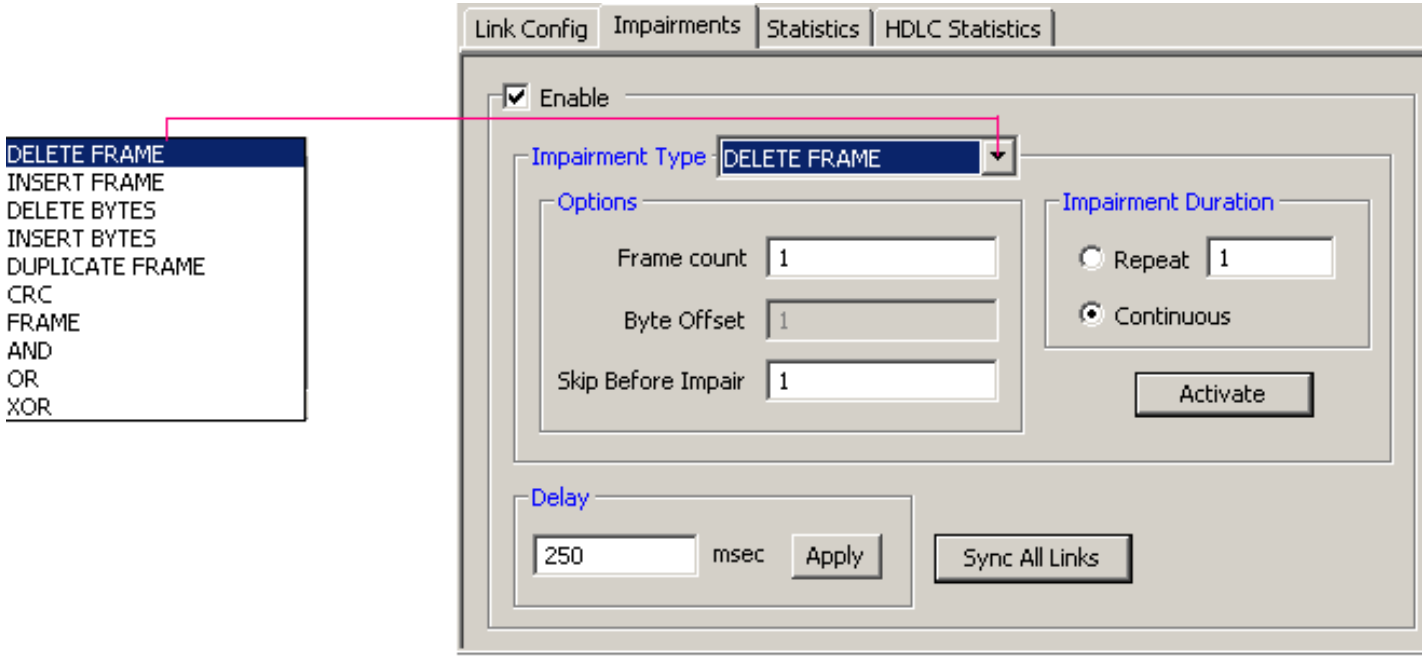
Simulating MFR Bundle

- Allows to create a virtual interface referred as 'bundle' interface
- An MFR bundle can consist of multiple physical links of the same type or physical links of different types
- Data sent through this channel will be distributed among all the links
- It is used to derive larger bandwidth pipe by aggregating smaller bandwidth pipes e.g. from multiple T1s or E1s



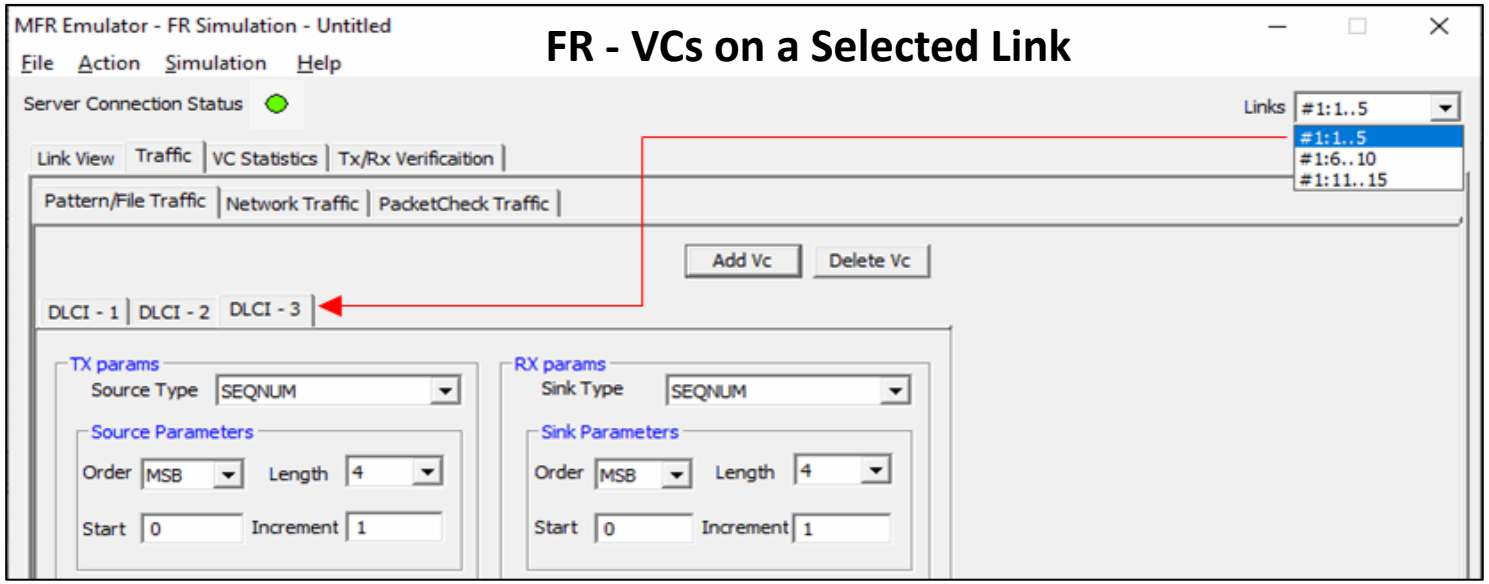
Impairments

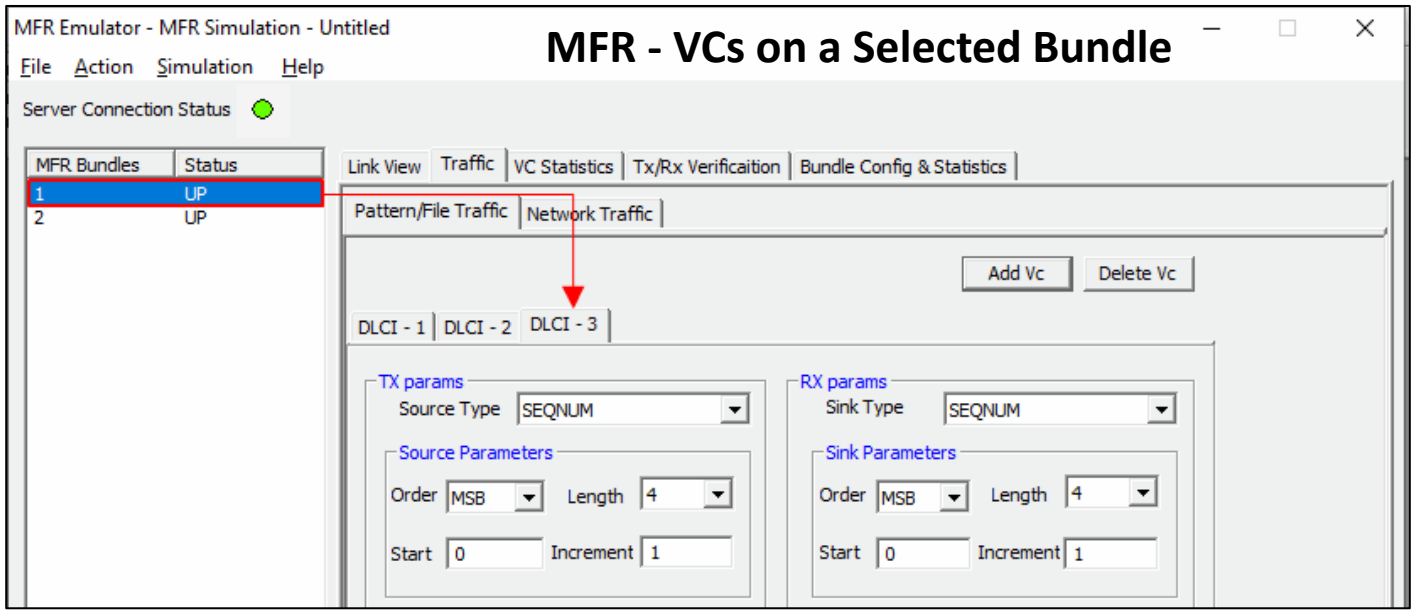
- Enable the user to intentionally introduce errors in data transmission.
- Impairments can be applied at different levels, i.e.
  - Impair all packets sent over a Physical Link
  - Impair frames on a particular Virtual Channel [VC may be on a physical link or on the MFR bundle]
  - Impair frames on a particular Aggregated Virtual Channel
  - Impair all packets on the MFR bundle



Pattern/File Traffic

- The source of the traffic is either a file or a repetitive pattern as defined by the user
- Traffic type can be used for end-to-end testing of the link
- The verification process will provide results such as how many frames are received and out of which how many have been matched successfully with configured pattern, similarly, how many frames modified etc.
- BERT test can also be conducted using various pre-defined patterns or a user defined pattern file





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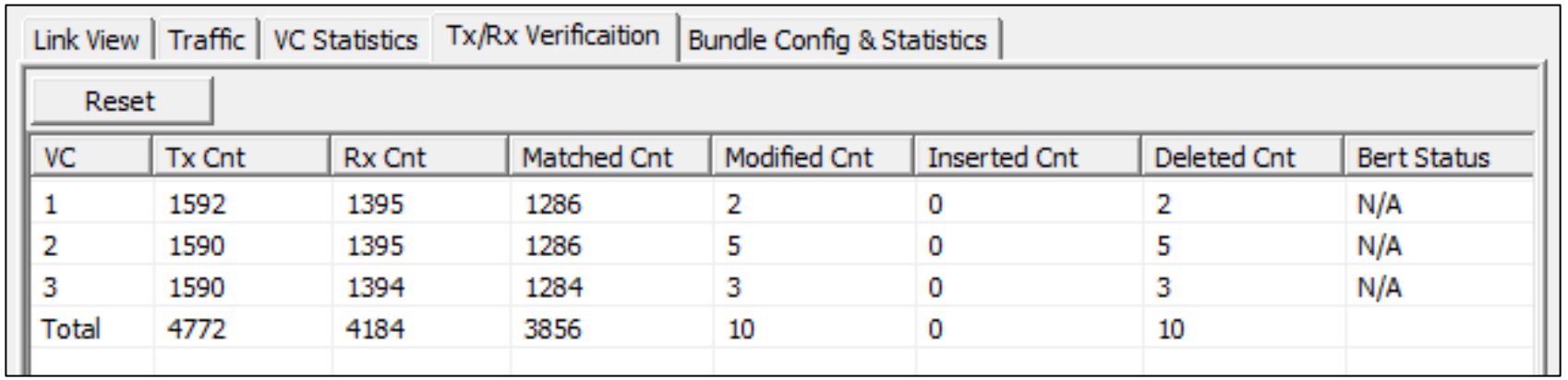
TxRx Verification

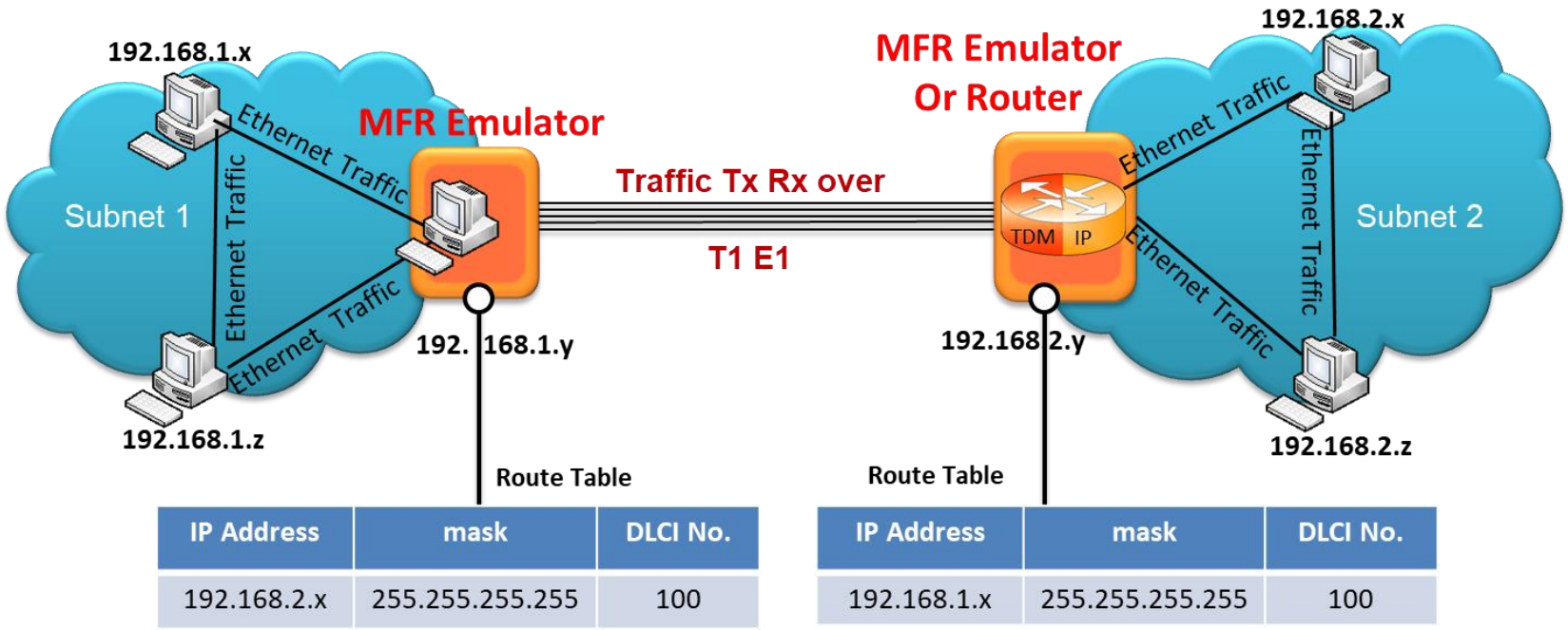


VC	Tx Cnt	Rx Cnt	Matched Cnt	Modified Cnt	Inserted Cnt	Deleted Cnt	Bert Status
1	1592	1395	1286	2	0	2	N/A
2	1590	1395	1286	5	0	5	N/A
3	1590	1394	1284	3	0	3	N/A
Total	4772	4184	3856	10	0	10	

- The results of the verification for each of the added VCs are available in Tx/Rx Verification
- The statistics include:
  - The number of VCs created
  - The number of frames transmitted successfully
  - The number of frames received successfully
  - If a received frame is verified successfully, then it will be included in "Matched" Frame Count
  - If a received frame does not match, it will be included in the "Modified" Frame Count
  - If the frame is lost then it will be included in "Deleted" Frame Count
  - If extra frames have been received which were not expected then they will be included in Inserted Frame Count

Network Traffic - MFR Emulator as a Router

- Allows user to setup routing table by configuring IP Address and Mask
- Once configured, the emulator forwards the IP packets which match routing criteria over MFR links
- Emulator responds to all ARP requests whose IP addresses present in routing table
- The image shows two networks, **Subnet1** and **Subnet2**, connected through T1 E1 lines using MFR Emulator that is configured to work as router



Route Table

IP Address	mask	DLCI No.
192.168.2.x	255.255.255.255	100

Route Table

IP Address	mask	DLCI No.
192.168.1.x	255.255.255.255	100

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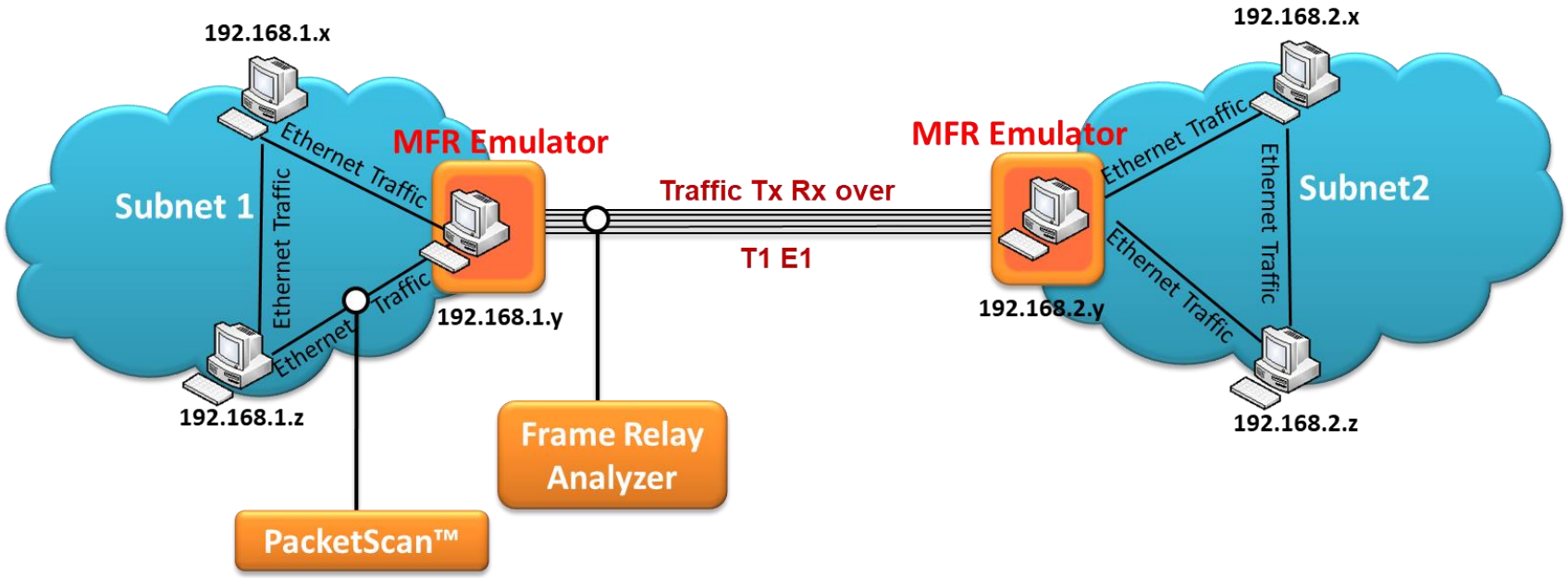
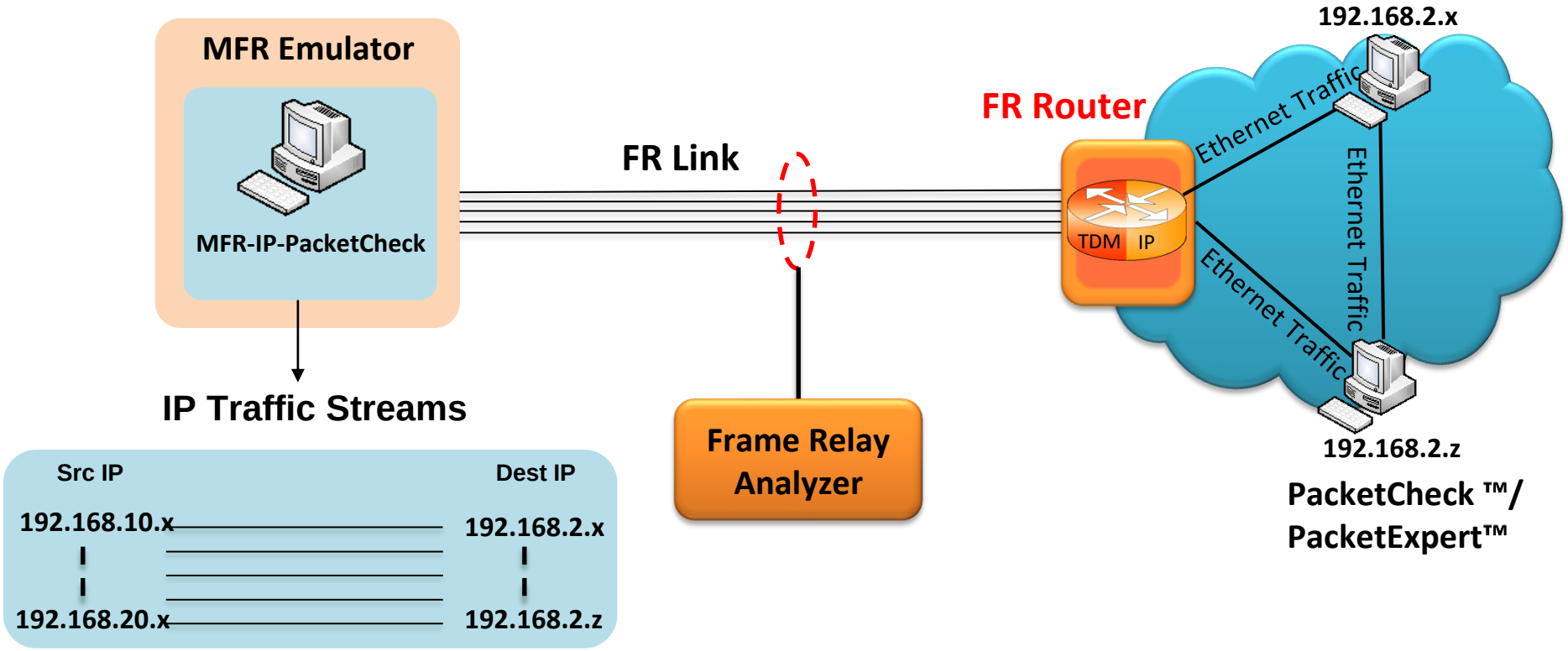
Network Traffic - MFR Emulator as a Bridge



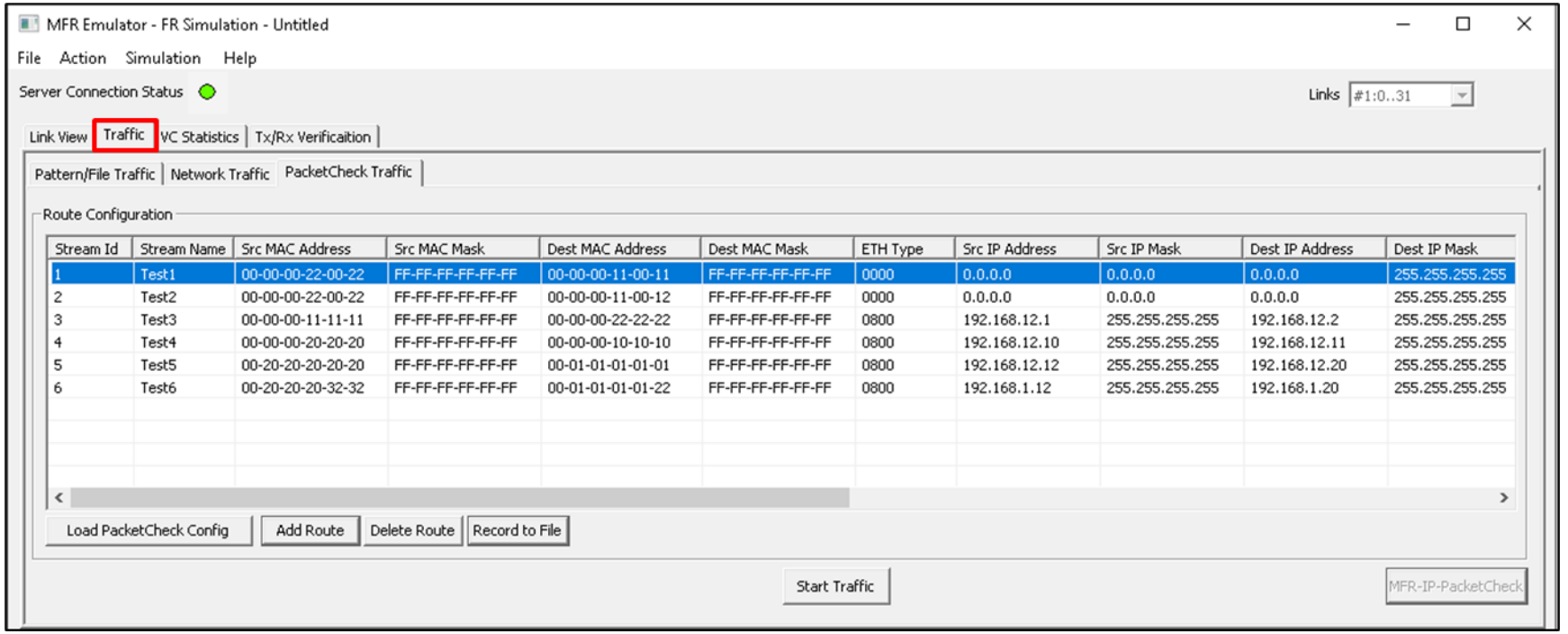
- When the MFR Emulator is configured to act as bridge between two networks, all ARP and traffic received from the network is encapsulated as bridged IP and streamed over T1 E1 links
- The Emulator on another network removes bridging header, converts to Ethernet and streams to the destination

PacketCheck™ Traffic



- 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
- VCs can be configured to encapsulate 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
- FR Router shall be tested for routing the received packets to the proper destination

PacketCheck™ Traffic Configuration



- Supports Layer 2, Layer 3 and Layer 4 Bert packets to send out via Route table
- Allows to create multiple Routes and multiple VCs on the FR links
- Each Route will have its own route criteria and an assigned VC
- Packets that pass through the defined criteria of a route, will be transmitted on the VC assigned to that route

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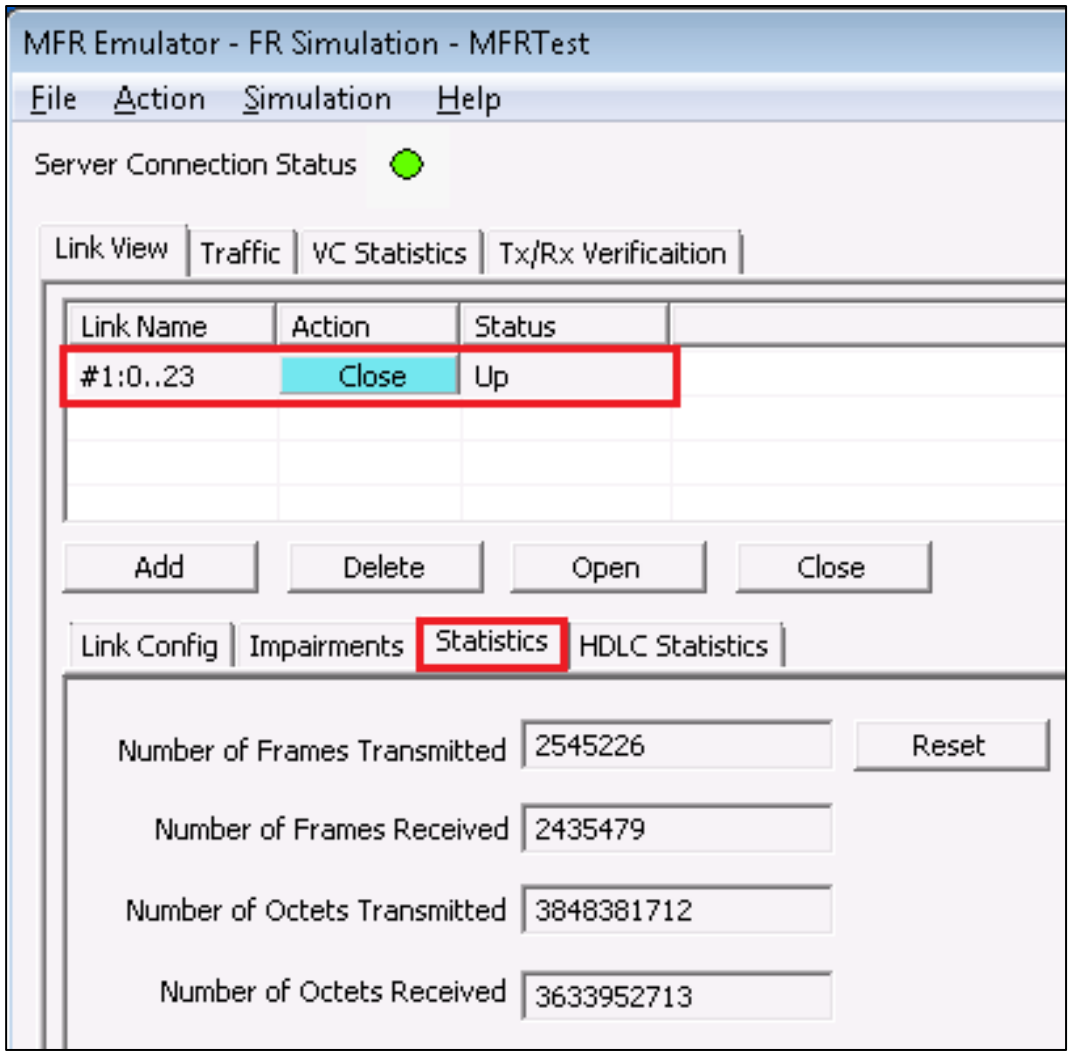
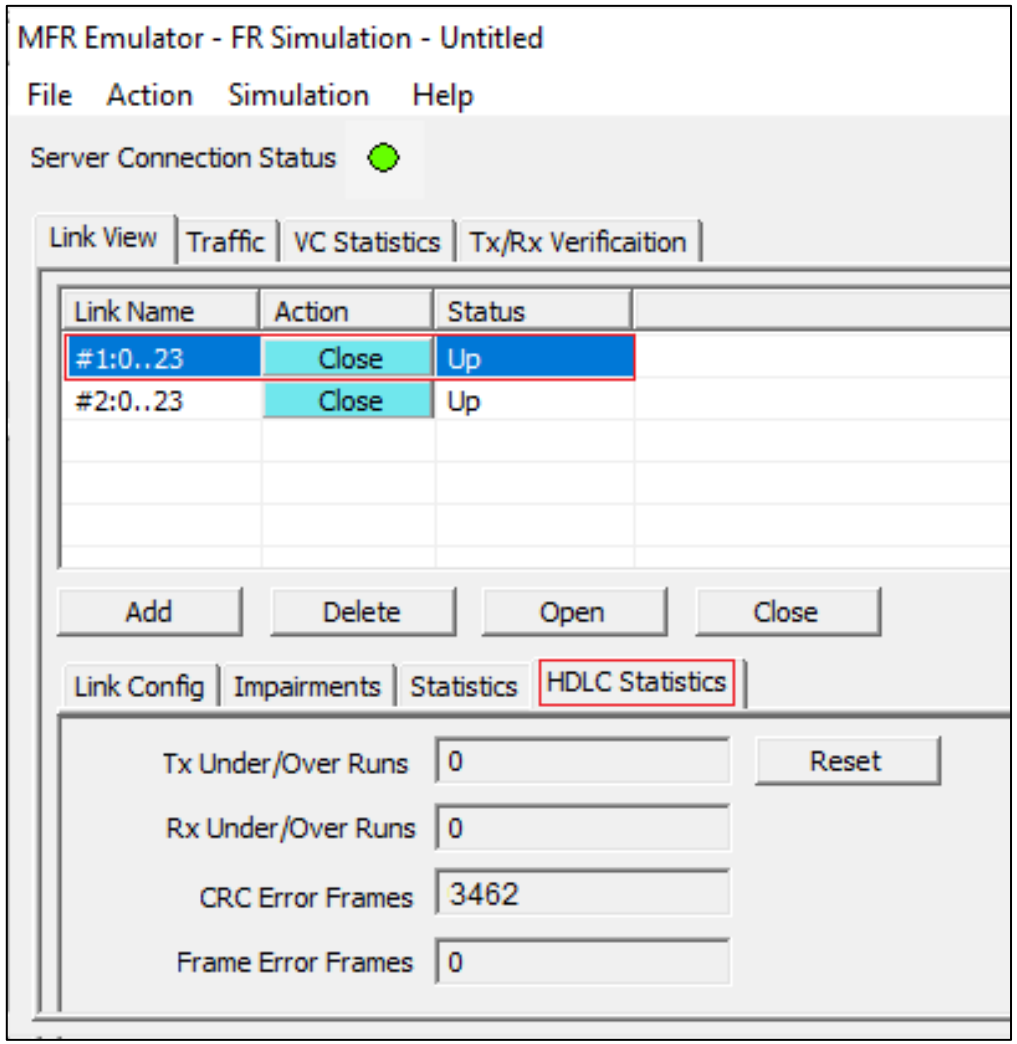
Linked Statistics

- Provides important statistics information for the selected link such as such as the Number of frames transmitted, Received frames, Octets Transmitted, and Octets Received

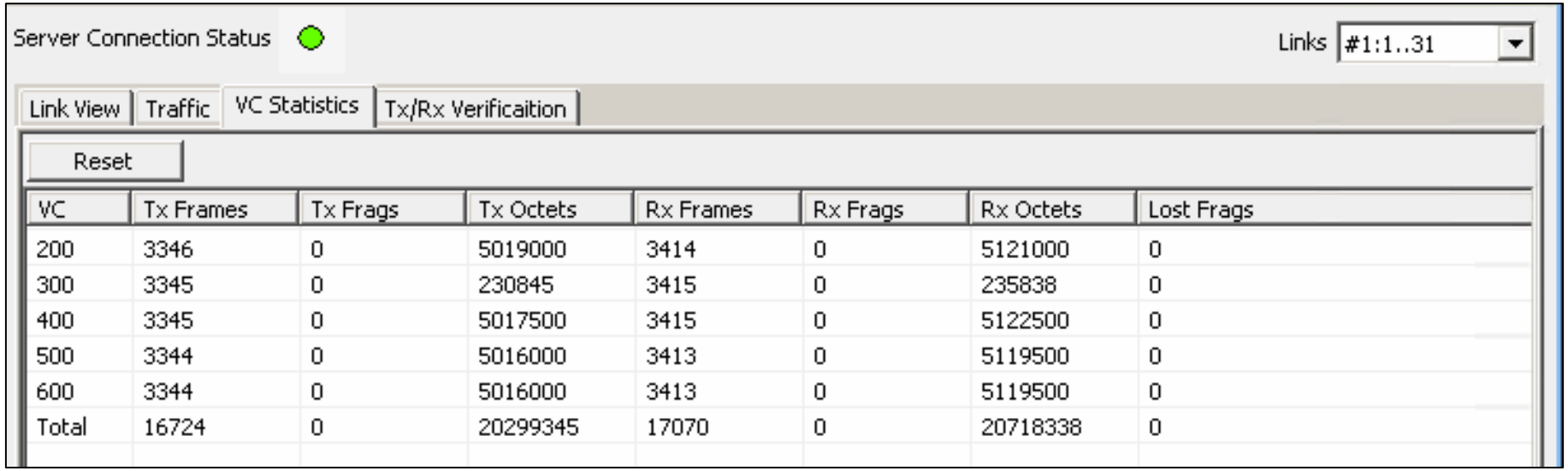


HDLC Statistics

- Errors that occur during transmission / reception like the Tx Under/Over Runs, Rx Under/Over Runs, number of FR packets with bad FCS, and number of packets with Frame Errors is recorded in the HDLC Statistics fields



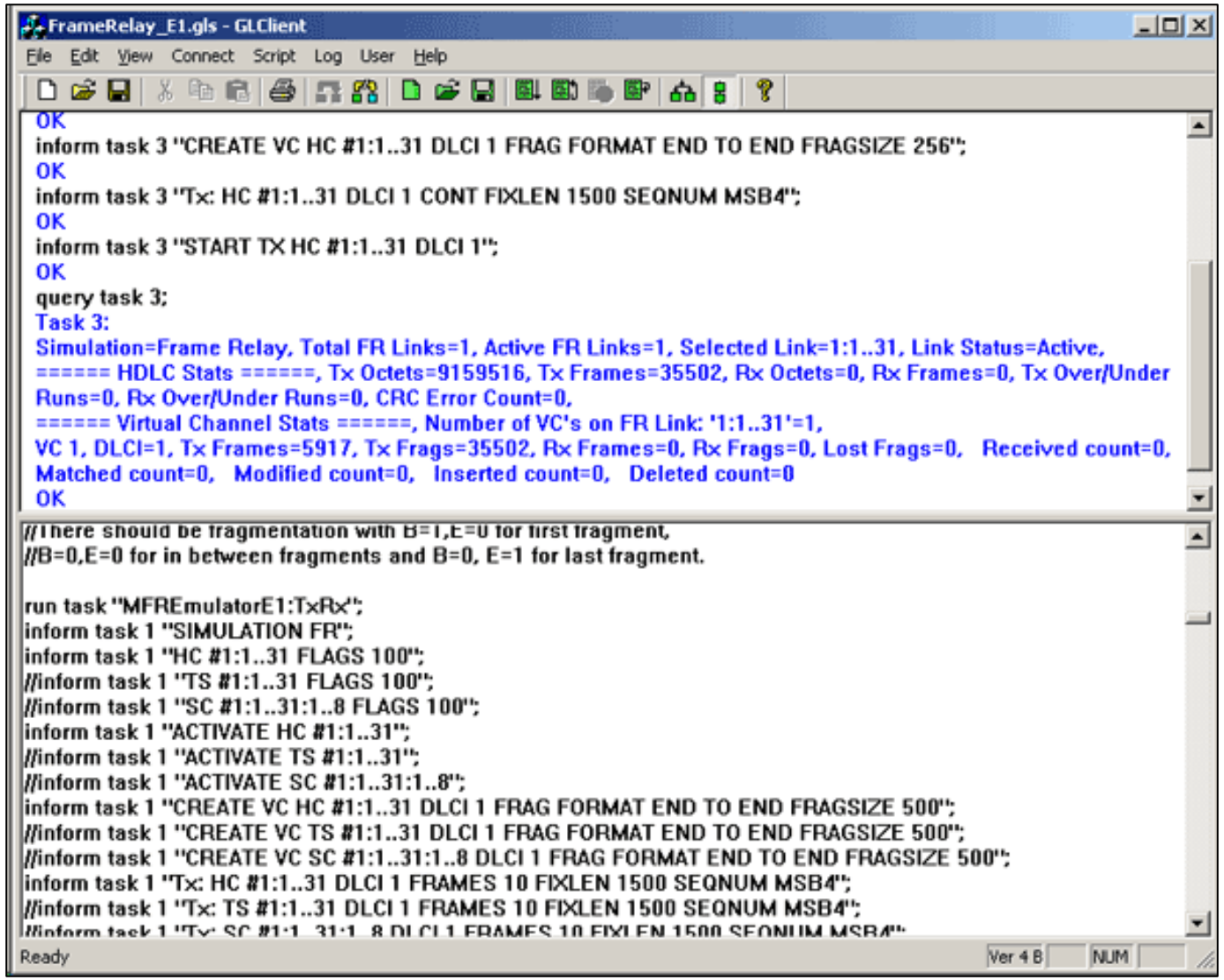
VC Statistics



VC	Tx Frames	Tx Frags	Tx Octets	Rx Frames	Rx Frags	Rx Octets	Lost Frags
200	3346	0	5019000	3414	0	5121000	0
300	3345	0	230845	3415	0	235838	0
400	3345	0	5017500	3415	0	5122500	0
500	3344	0	5016000	3413	0	5119500	0
600	3344	0	5016000	3413	0	5119500	0
Total	16724	0	20299345	17070	0	20718338	0

- The statistics for each of the added VCs are available and these include number of Transmitted and received frames, Fragments, Octets, and Lost fragments

MFR Simulation in Command Line Interface



Thank you