eCPRI Protocol Analysis

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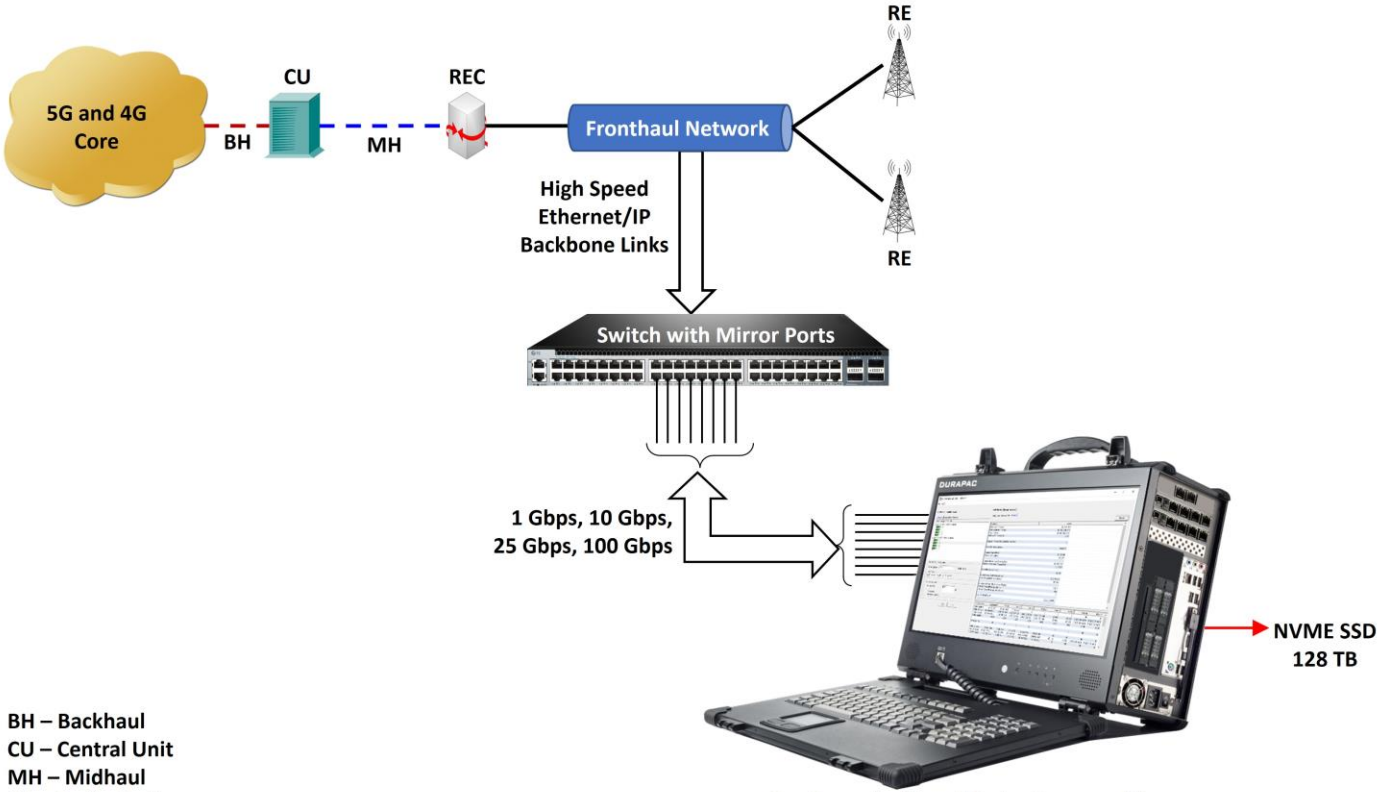
Network Architecture



BH – Backhaul
CU – Central Unit
MH – Midhaul
RE – Radio Equipment
REC – Radio Equipment Controller

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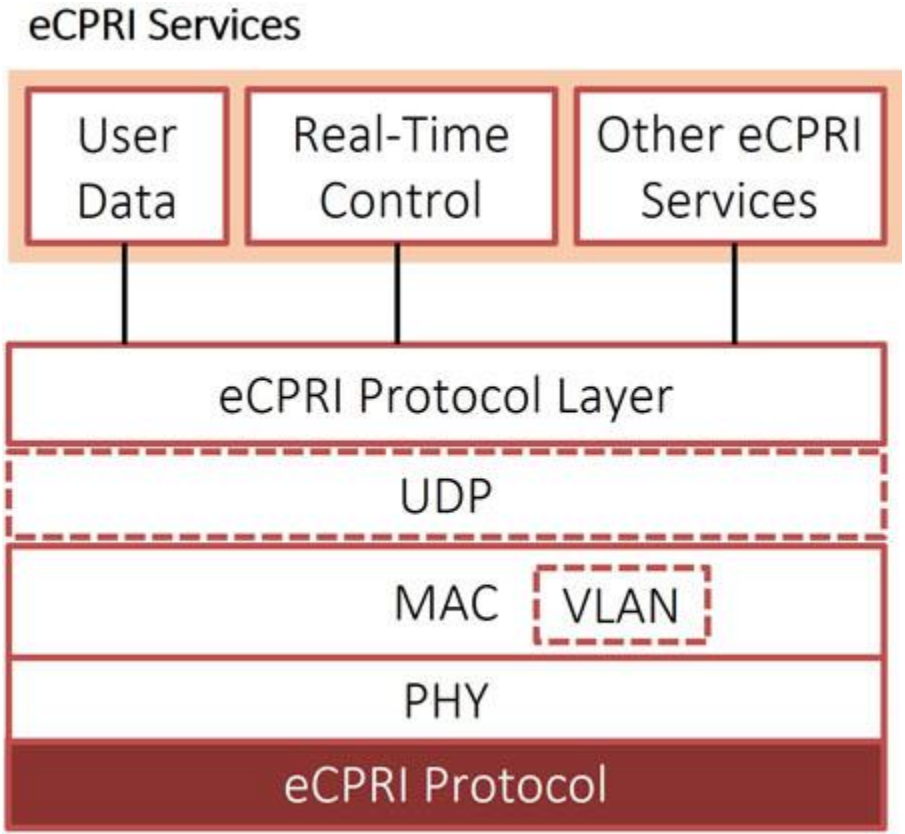
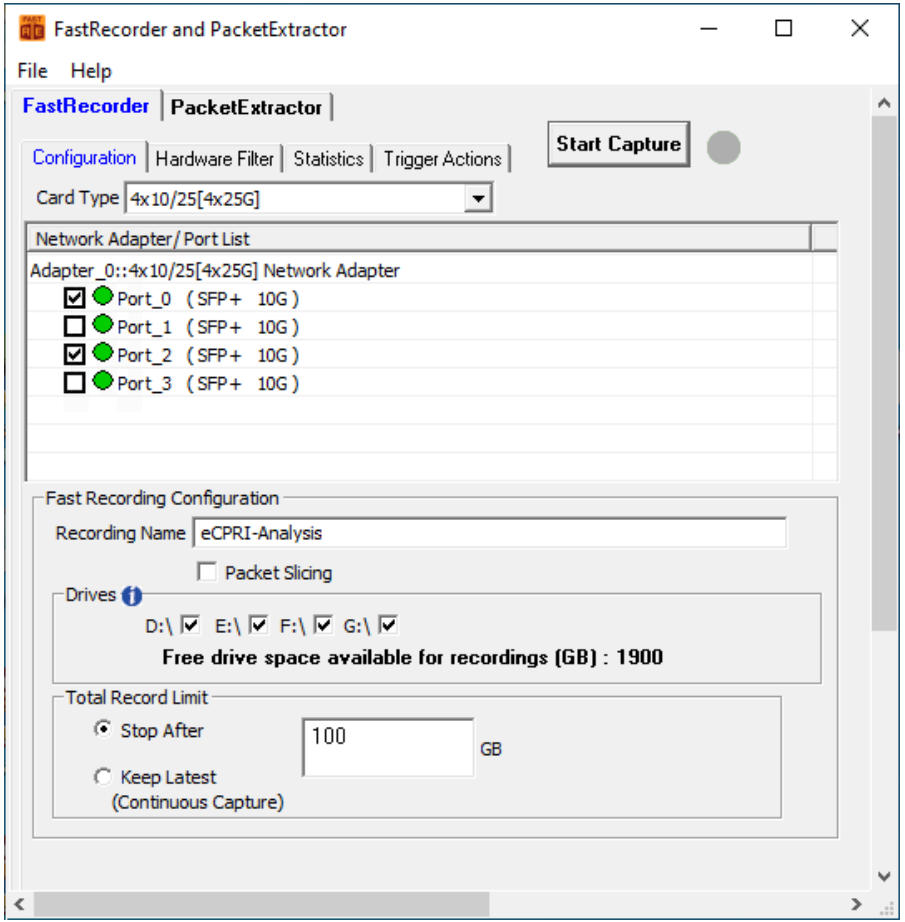
eCPRI Protocol Stack

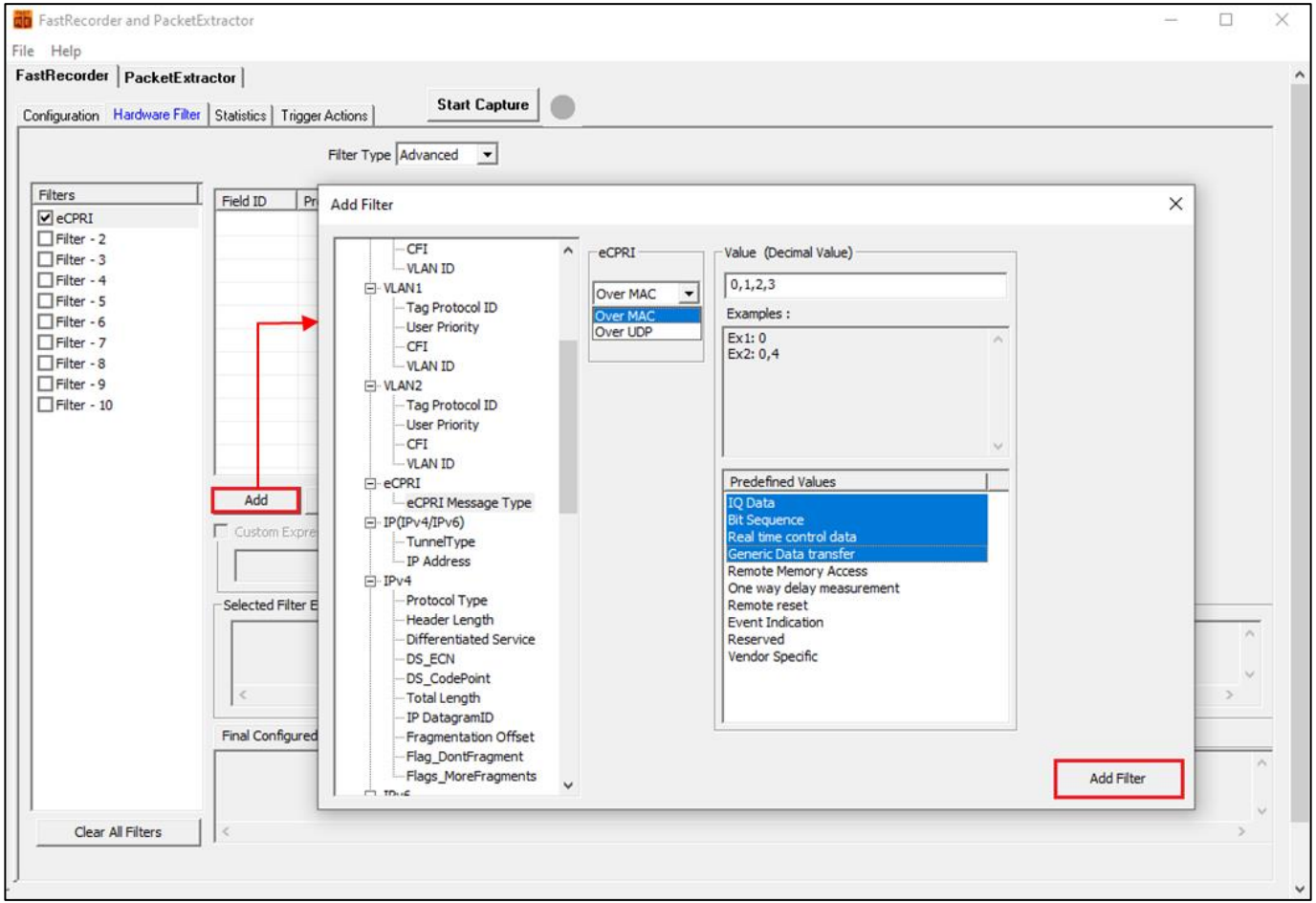


Monitoring eCPRI on FastRecorder™ Application

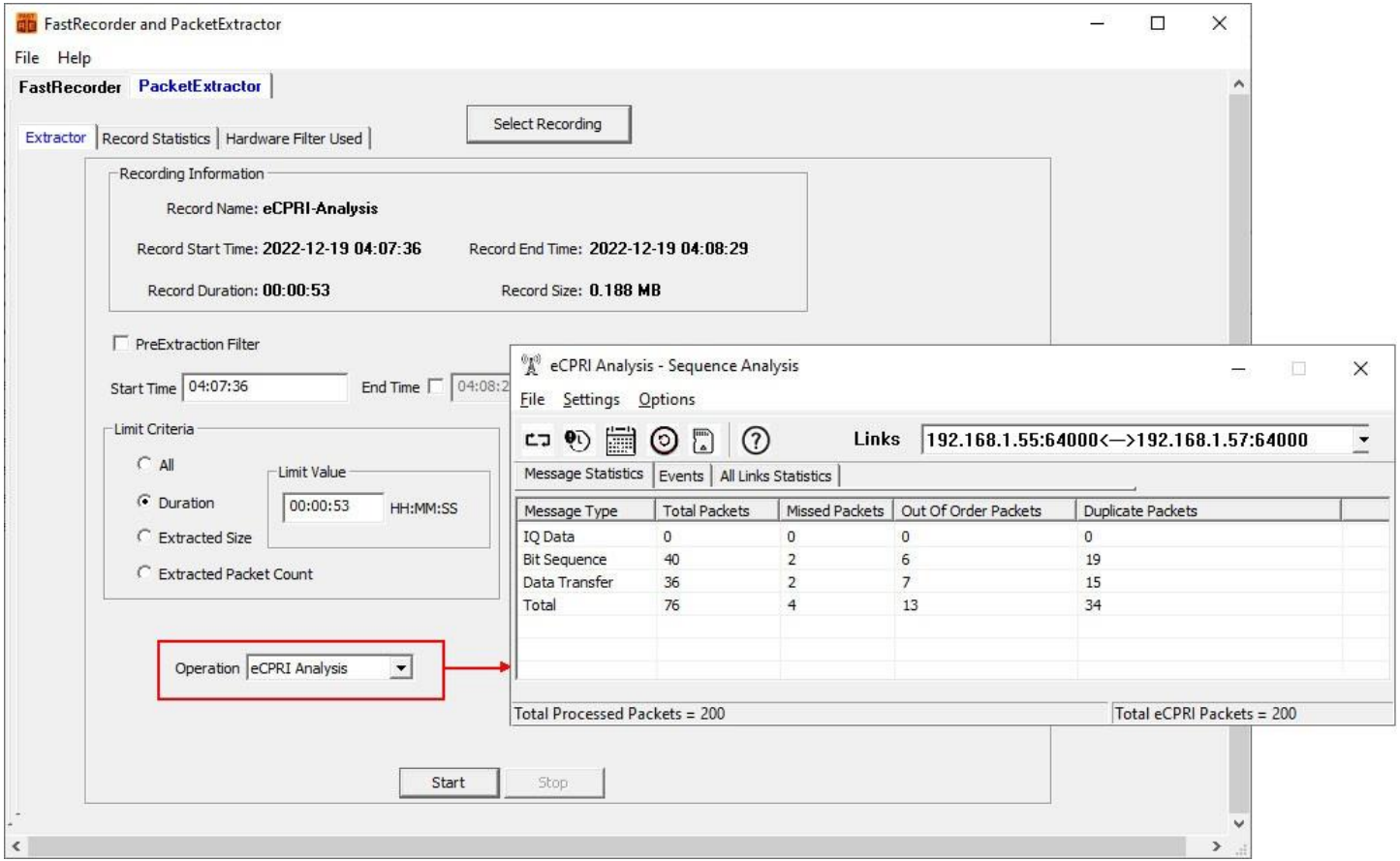
- FastRecorder™ and PacketExtractor™ analyzer supports **eCPRI** analysis feature to monitor **eCPRI** traffic for packet impairments such as Missed Packets, Out of Order, Duplicate Packets, One-Way Delay etc.



Configuring Hardware Filter for eCPRI Analysis



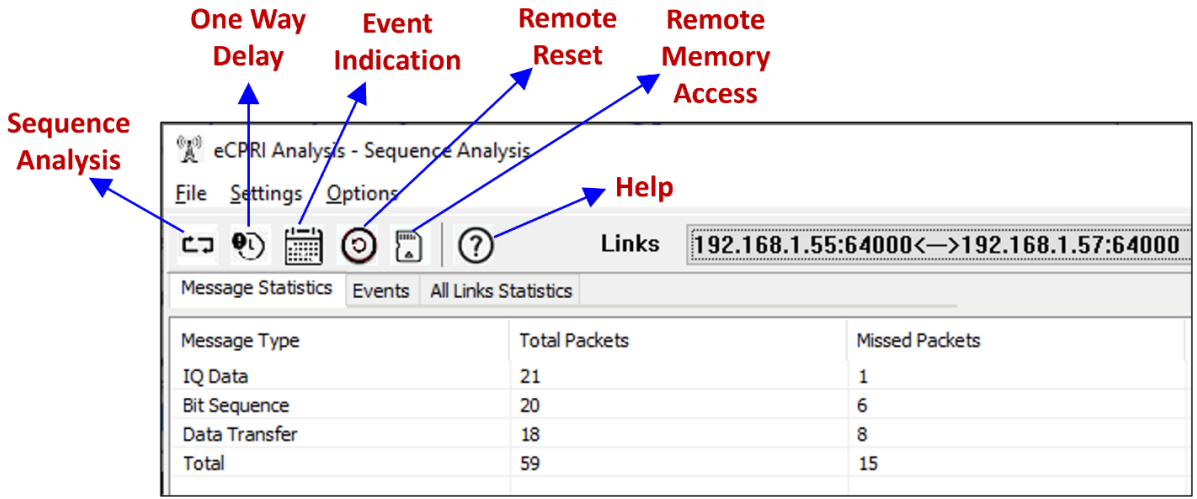
Invoking eCPRI Application



Shortcut Icons of eCPRI Message Statistics

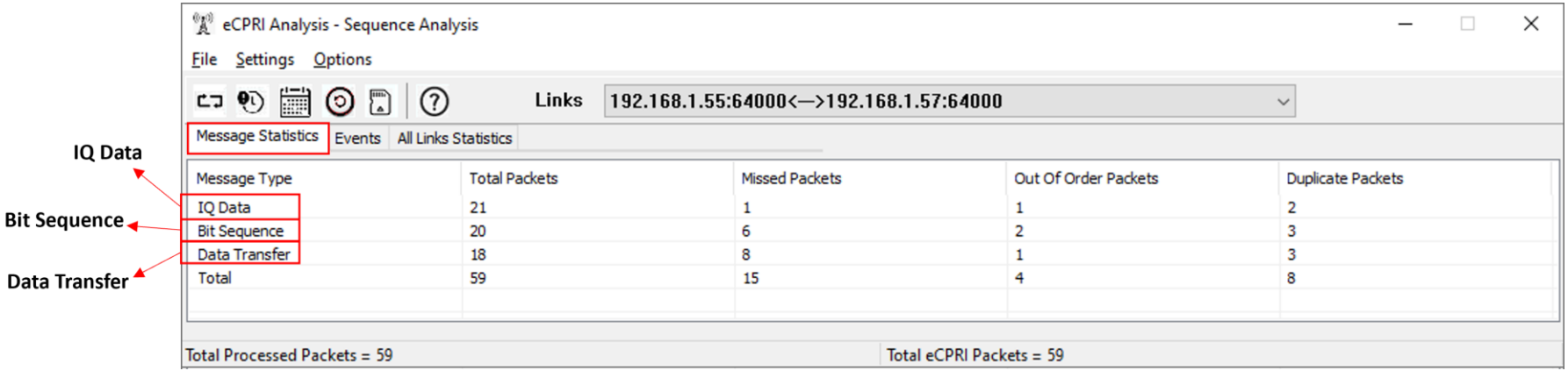
eCPRI application provides the following message statistics.

- Sequence Analysis
- One-Way Delay Measurement
- Event Indication
- Remote Reset
- Remote Memory Access



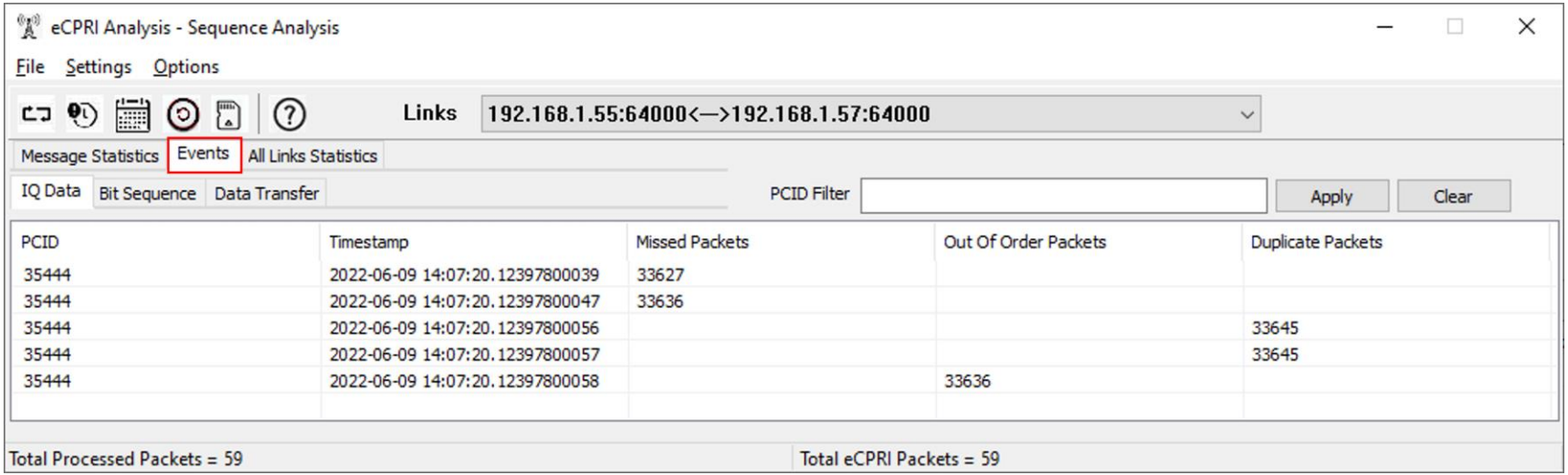
Sequence Analysis

- Analyzes the packet sequences of eCPRI Message types such as IQ Data, Bit Sequence, and Data Transfer, and generates packet statistics based on PCID, SEQID, and Data samples
- The analysis results are displayed in separate tabs, including **Message Statistics**, **Events**, and **All Links** Statistics

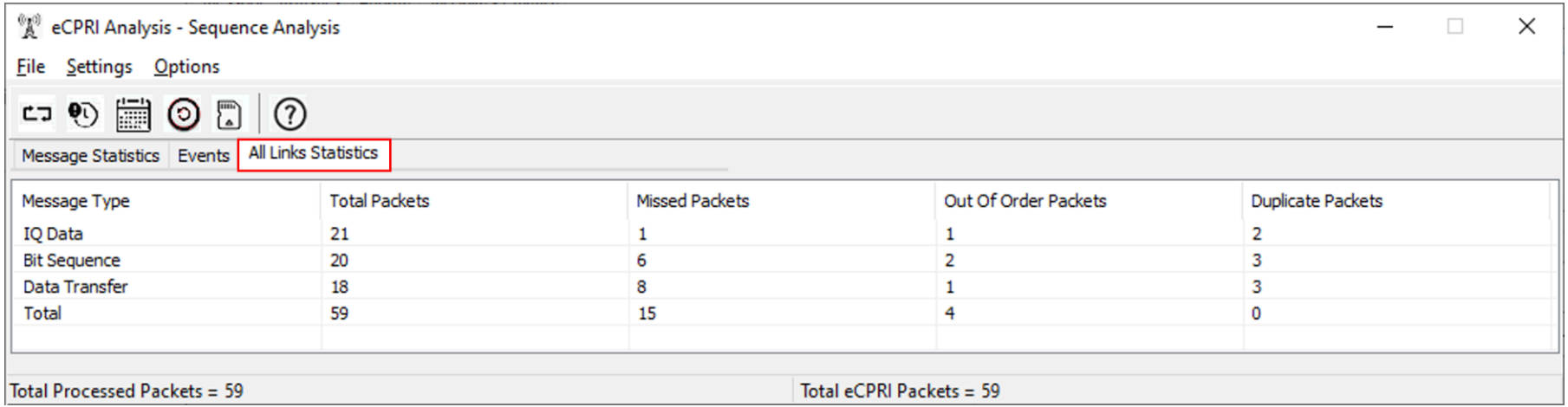


Events

- The **Events** tab displays Packet Statistics like
  - Missed Packets (Provides the range if more than one packet is missed),
  - Duplicate Packets
  - Out of Order Packets Sequence Number for each PCID at the time of occurrence for IQ, Bit Sequence, and Data Transfer respectively



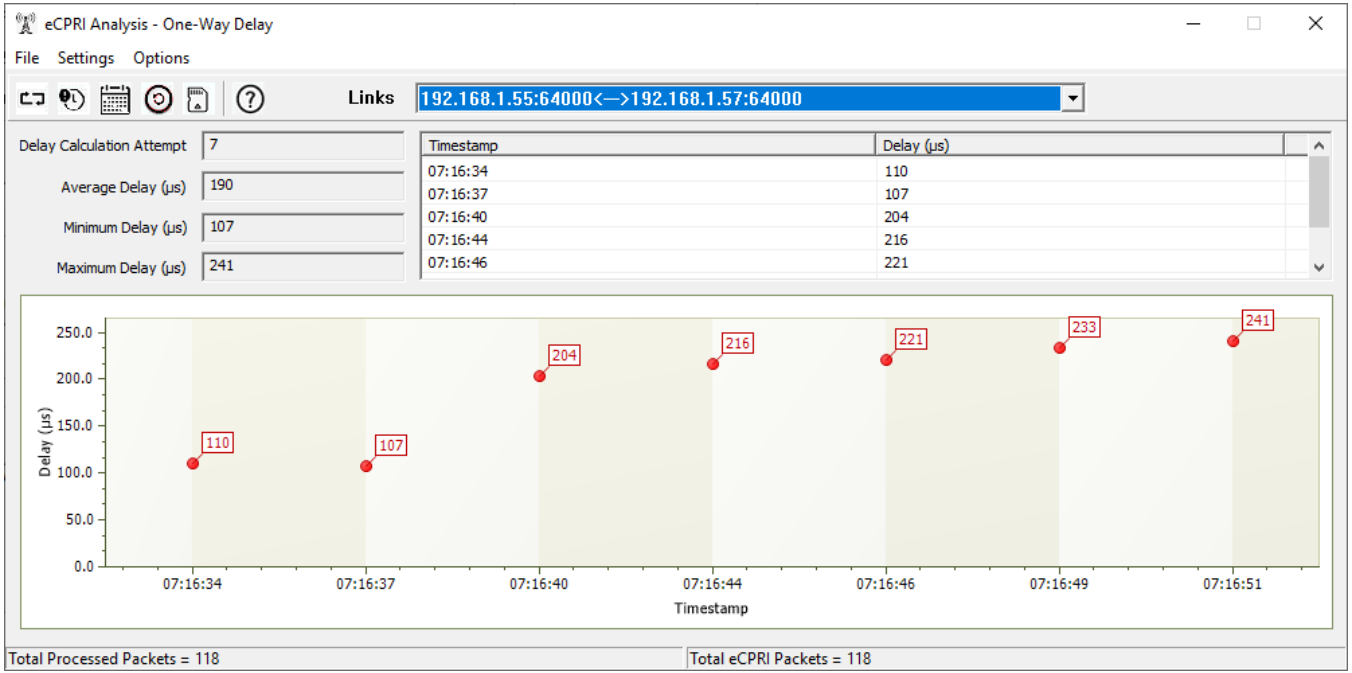
All Links Statistics



- Displays sequence analysis for all available eCPRI links. This tab shows the aggregation of IQ Data, Bit Sequence, Data Transfer, Total Packets, Missed Packets, Out of Order Packets, and Duplicate Packets for each message type across all links

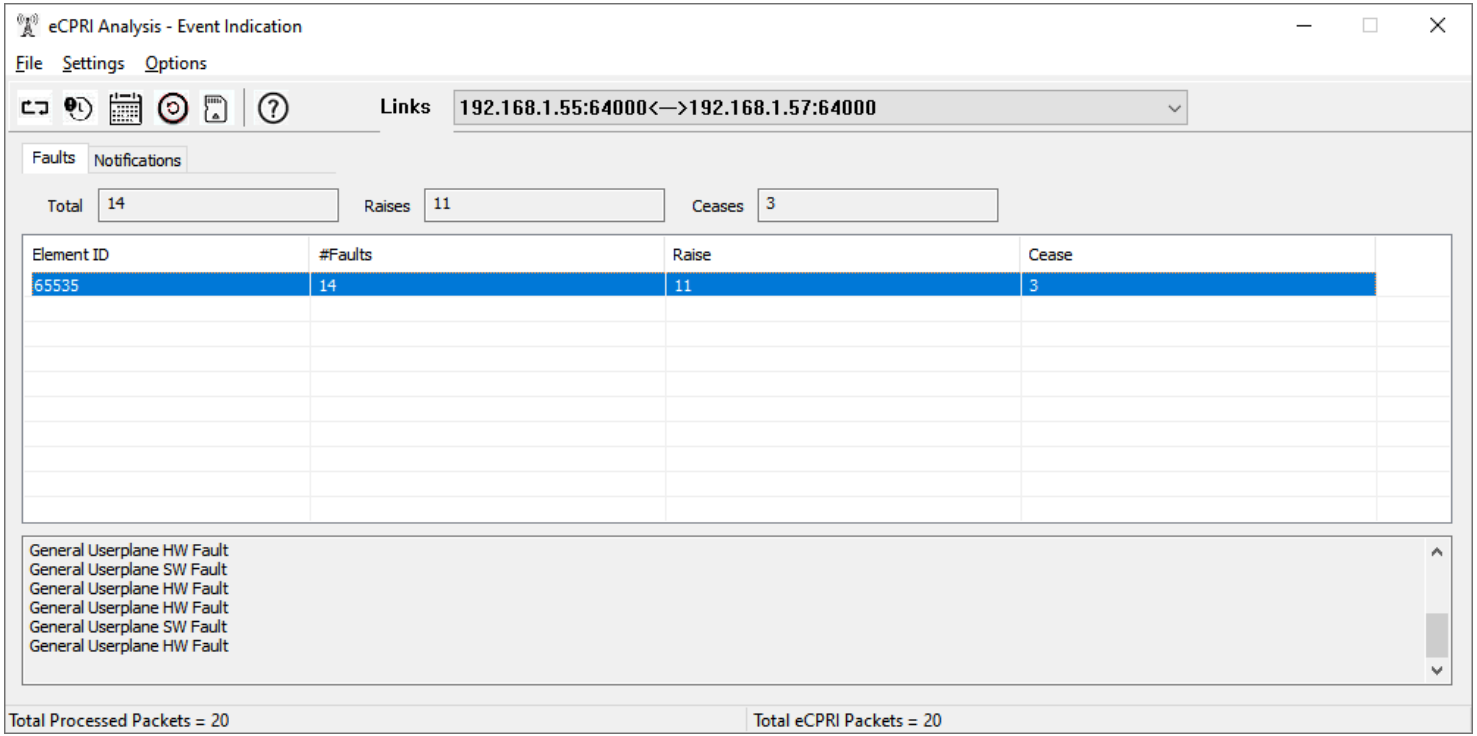
One-Way Delay Measurement

- Displays the number of delay attempts, the average delay, and the minimum and maximum delay in microseconds
- The delay values are plotted on a Point graph, which calculates the values at different intervals. The same values are also added to a table for each link

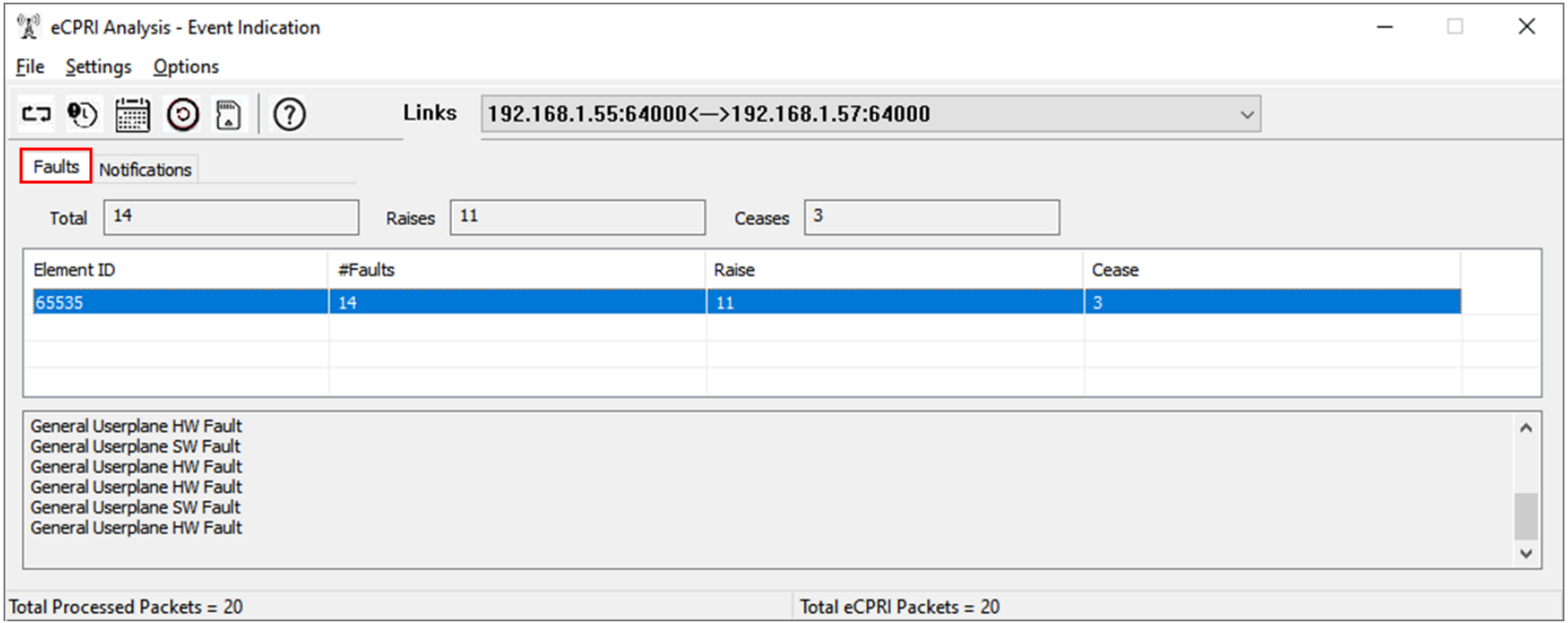


Event Indication

- Indicates events that occurred between two eCPRI nodes
- An event in Event Indication can contain one or more faults (raises/ceases) or notifications related to user data processing
- The **Faults** and **Notifications** are displayed in separate tabs in this dialog



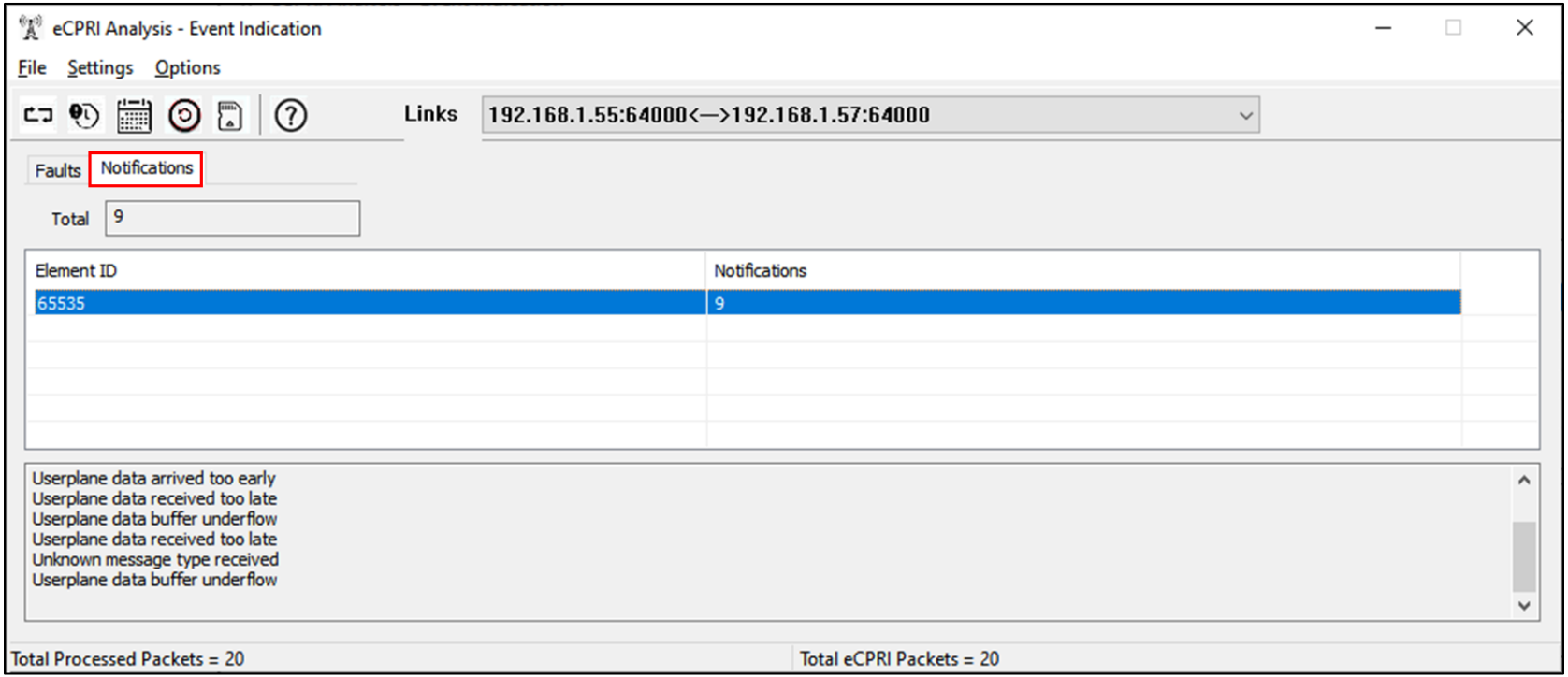
Fault Indication



- Displays the total number of faults, as well as the number of raises and ceases. Additionally, the tab shows these statistics for each element represented by the Element ID in a tabular column
- The **Faults** tab also displays any hardware, software, or vendor-specific faults for the selected Element ID

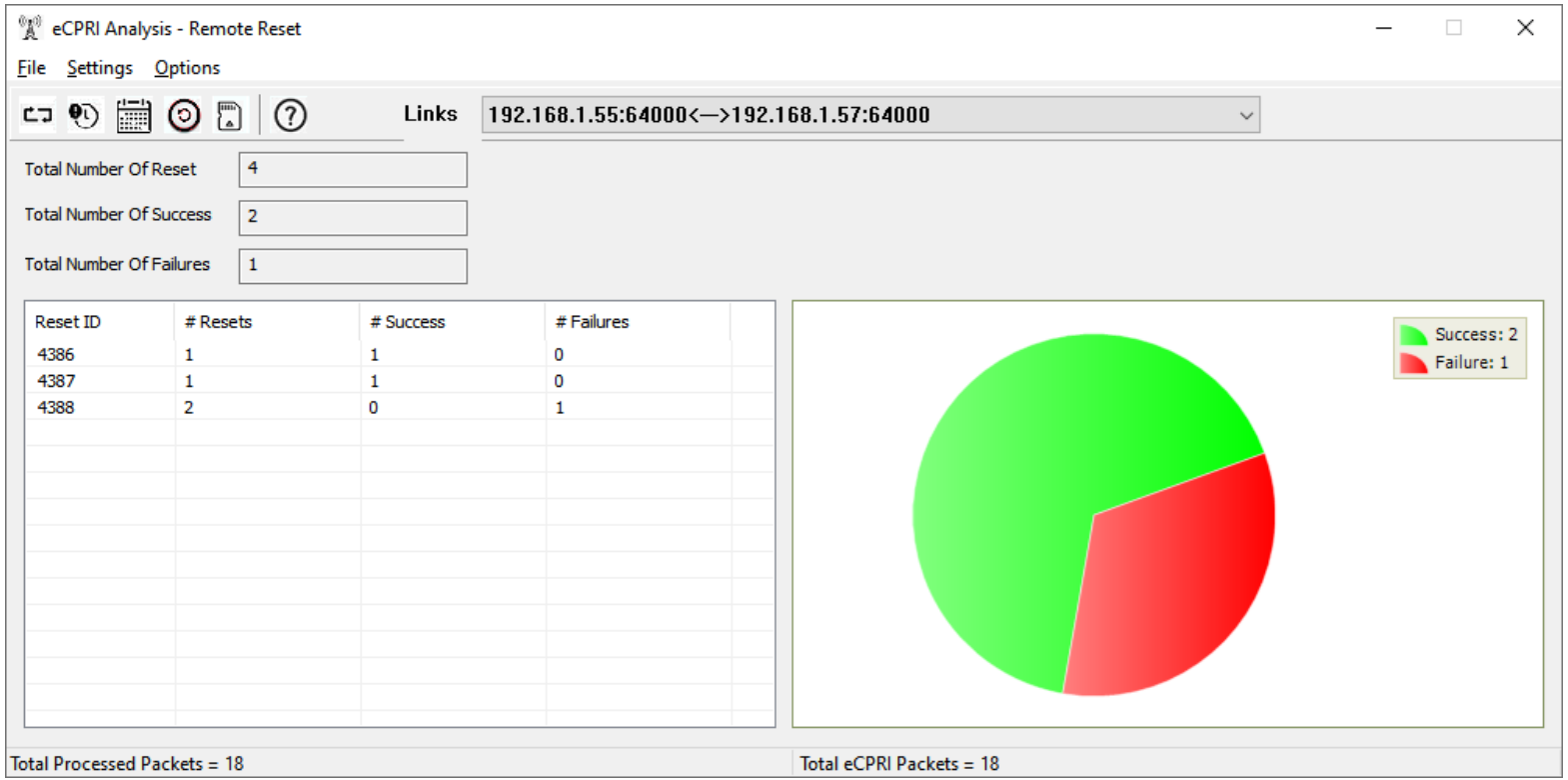
Notifications

- The **Notification** tab shows the total number of notifications, as well as notifications for each Element ID displayed in a tabular column
- In addition, the **Notification** tab displays User Plane Data issues for the selected Element ID, such as Data arriving too late, Data Buffer Overflow, Data Buffer Underflow, and Data arriving too early



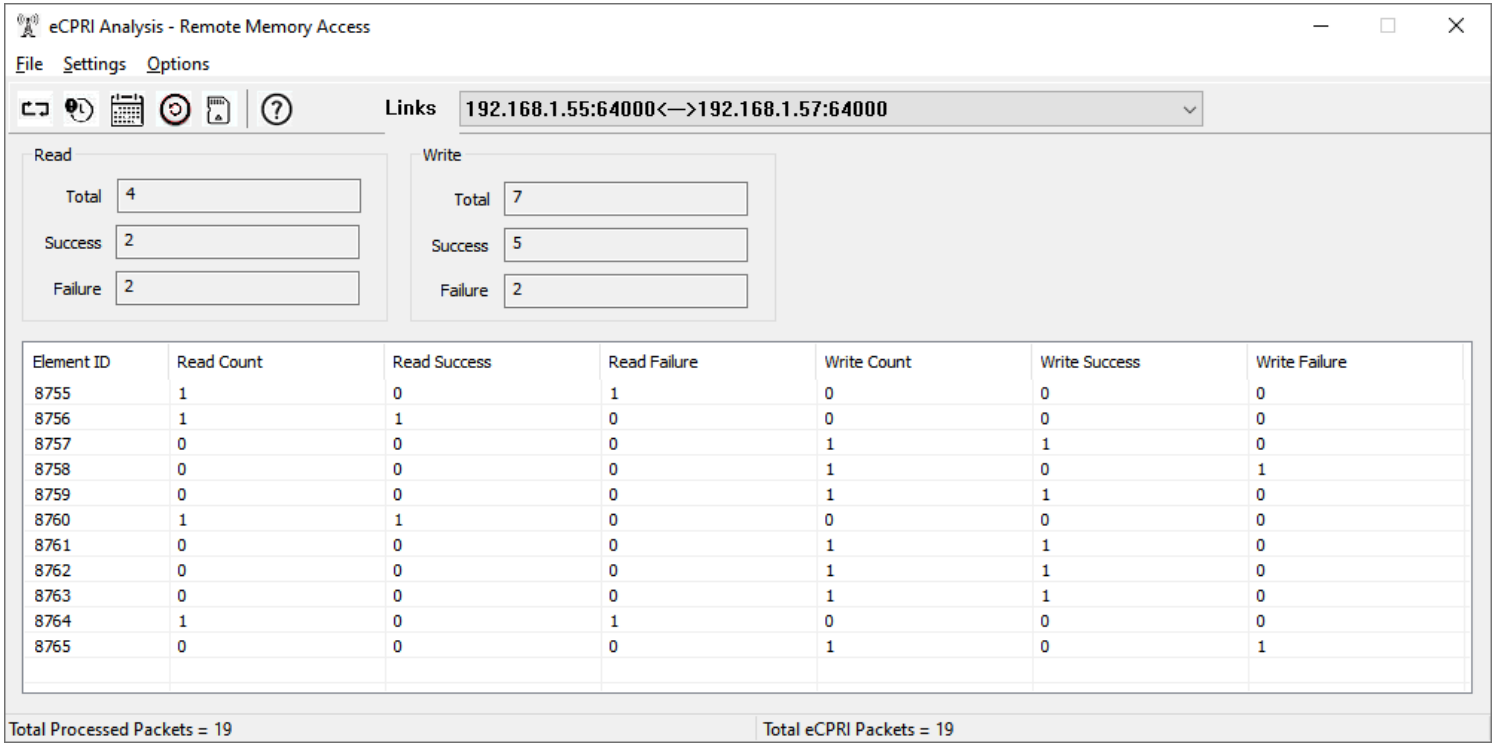
Remote Reset

- Displays statistics for each Reset ID, including the total number of successful and failed resets, as well as the total number of resets with successful and failed outcomes. The statistics are shown both in a PIE graph and in a tabular column



Remote Memory Access

- Displays statistics for each Element ID, as well as the total number of successful and failed read and write operations
- The statistics include the total Read Count, Read Success, Read Failure, Write Count, Write Success, and Write Failure for each Element ID, as well as the total statistics for all the elements



Analysis of eCPRI Decodes in Offline PacketScan™ HD

Over UDP

```
Device0 Frame=6 at 2022-06-09 06:07:36.711206000 OK Len=112                    *** Right c
Ethernet Frame Data
    ============ MAC Layer ============          =
0000 Destination Address                         = xFCAA149225C4
0006 Source Address                              = x54BEF737CB9A
000C Length/Protocol Type                        = x86DD IPv6
    ============ IPv6 Layer ============         =
000E Protocol Version                            = 0110.... (6)
000E Traffic Class                               = 0 (....0000 0000....)
000F Flow Label                                  = 834513 (....1100 10111011 11010001)
0012 Payload Length                              = 58 (x003A)
0014 Next Header                                 = 00010001 User Datagram Protocol (UDP)
0015 Hop Limit                                   = 64 (x40)
0016 Source Address                              = fe80::64f2:5e84:f1db:502
0026 Destination Address                         = fe80::589e:b2d5:9074:2bec
    ============ UDP Layer ============          =
0036 Source Port                                 = 64000 (xFA00)
0038 Destination Port                            = 64000 (xFA00)
003A Length (Header + Data)                      = 58 (x003A)
003C Checksum                                    = x7F76
    ============ eCPRI Layer ============        =
003E C                                           = .......0 eCPRI message is the last one inside the eCPRI PDU
003E eCPRI Protocol Revision                     = 0001.... (1)
003F eCPRI Message Type                          = 00000100 Remote Memory Access
0040 eCPRI Payload Size                          = 28 (x001C)
0042 Remote Memory Access ID                     = 17 (x11)
0043 Req/Resp                                    = ....0010 Failure
0043 Read/Write                                  = 0010.... Write_No_Resp
0044 Element ID                                  = 8755 (x2233)
0046 Address                                     = x050403020100
004C Length                                      = 16 (x0010)
     User Data                                   = xFFEEDDCCBBAA99887766554433221100
```

Analysis of eCPRI Decodes in Offline PacketScan™ HD

Over MAC

```
Device0 Frame=0 at 2019-02-13 11:36:46.000000000 OK Len=64                    *** Right
Ethernet Frame Data
    ============ MAC Layer ============          =
0000 Destination Address                         = x008016000000
0006 Source Address                              = x008016884EFF
000C Length/Protocol Type                        = xAEFE eCPRI
    ============ eCPRI Layer ============        =
000E C                                           = .......0 eCPRI message is the last one inside the eCPRI PDU
000E eCPRI Protocol Revision                     = 0001.... (1)
000F eCPRI Message Type                          = 00000000 IQ Data
0010 eCPRI Payload Size                          = 20 (x0014)
     eCPRI Payload                               = x123487650F0E0D0C0B0A09080706050403020100
    ============ O-RAN Fronthaul CUS Layer ============ =
     ecpriPcid                                   =
0012  BandSector_ID                              = ..010010 (18)
0012  DU_Port_ID                                 = 00...... (0)
0013  RU_Port_ID                                 = ....0100 (4)
0013  CC_ID                                      = 0011.... (3)
     ecpriSeqid                                  =
0014  Sequence ID                                = 135 (x87)
0015  Subsequence ID                             = .1100101 (101)
0015  E bit                                      = 0....... More fragments follow
0016 FilterIndex                                 = ....1111 Reserved
0016 payloadVersion                              = .000.... (0)
0016 dataDirection                               = 0....... UpLink
0017 frameId                                     = 14 (x0E)
0018 subframeId                                  = 0000.... (0)
0018 slotId                                      = 52 (....1101 00......)
0019 startSymbolid                               = ..001100 (12)
001A sectionId                                   = 176 (00001011 0000....)
001B symInc                                      = .....0.. use the current symbol number
001B rb                                          = ....1... every other RB used
001B startPrbu                                   = 521 (......10 00001001)
001D numPrbu                                     = 8 (x08)
     udCompHdr                                   =
001E  udCompMeth                                 = ....0111 Reserved
001E  udIqWidth                                  = 0000.... I and Q are each 16 bit wide
      Dump                                       = x050403020100
```

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Thank you