VegaStream
Information Note
Low level ISDN trace

Introduction.

When commissioning ISDN Vega equipment it is sometimes necessary to look at the low level ISDN communications to check how the attached device is interacting with the Vega. The Vega 400 E1/T1, Vega 100 E1/T1 and Vega 50 BRI products have a debug mode that allows the low level communications on the ISDN interfaces to be monitored.

This document specifies the commands to be used on the Vega and also identifies how to decode the resulting trace.

Related Specifications

1. Euro ISDN layer 2 – ETS 300 125 / Q.921
2. Euro ISDN layer 3 – ETS 300 102-1 / Q.931
3. DMS layer 2 and 3 – NIS A211-1

Please note that running Vega gateways in debug mode is only designed for test situations. The Vega is not tested to run under load with debug enabled.

Enabling ISDN trace

To enable the ISDN trace plus provide Vega context information, enter the following lines on a telnet or serial Command Line Interface connection:

> ➢ Sip monitor on[1]
> ➢ Log display on
> ➢ Debug enable router rs
> ➢ debug enable _ISDN 89
> ➢ debug direct

The ISDN trace information will be displayed on the terminal. Capture the results to a file (e.g. use HyperTerminal's Transfer>Capture Text feature to capture all the output to a file).

N.B. It is important to configure your terminal emulator to be 132 rather than 80 characters wide, otherwise lines can wrap (get a carriage return in the wrong place). Wrapping of lines causes ISDN messages whose raw input covers multiple lines to be only partially be decoded – this can be mis-leading.

Decoding the ISDN trace

A special DOS based application is available to decode the raw ISDN trace information. This is available in zip'd form on the www.VegaAssist.com web site.
Installing the application:
1. Extract the files from the zip file into directory c:. This will create a directory c:\tools containing 'dec.bat' and 'decode.exe' and a second directory c:\tools\decode containing 'decode.dec'

Using the decoder:
1. Get a dos prompt, e.g. by typing cmd into the start>run command window
2. Add c:\tools into the DOS search path by typing
    > ➢ set path=%path%;c:\tools
3. Type
    > ➢ c:
    > ➢ cd \tools
4. To display the parameters for the decoder type
    > ➢ dec
5. Copy the captured raw trace into the c:\tools directory
6. Typically use:
    > ➢ dec in <infile.xxx> out <outfile.xxx>

<infile.xxx> should have a filename base with a maximum of 7 characters and an extension (xxx) with a maximum of 3 characters.

Gotcha!: *If the outfile turns out blank it is probably that the infile contains 'control characters' at the start. In some editors these may be shown as blank spaces, in other editors as squares. In order to allow the decoder to operate, edit the infile and on the first line of the file remove characters at the start of the line until a standard ascii character is at the beginning (A-Z, a-z, 0-9).*

---

[1] Only needed for SIP gateway

Parameters for the dec application:

```
C:\Tools>dec
------- TRACE DECODER VERSION 1.2 IN: OUT:decode.txt -------

usage: dec [sum] [l2] [l3] [TE/NT] [net] [dsl] [cref callref] in filein [out fileout]

where:
    sum = nodetail for summary only (no detail)
          nosummary for detail only (no summary)

    l2  = l2_off  no l2 decode
          l2_hex  for l2 hex decode
          l2_full for l2 full decode

    l3  = l3_off  no l3 decode
          l3_hex  for l3 hex decode
          l3_full for l3 full decode

    net = dms,etsi,att,ni2,qsig,dss1
    dsl = dsl1,dsl2,dsl3,dsl4
  TE/NT = TE,NT (if known)

 filein = trace input file
 fileout= trace output decode file

 default is:
    l2/l3 full decode, etsi, all DSLs, summary and detail, all cr's,
    default output file is decode.txt

 TRACE FILES:
   Pre-R5:
      filein extension = ".old"
      debug enable _TN i
      debug on

   R5 onwards:
      filein extension = anything other than ".old"
      debug enable _ISDN *RawRx,RawTx
      debug on
```

Example Decoded Trace

Below is a decoded trace of a call from phone '203' to phone '5007'. It include ISDN setup, call proceeding, alerting, connect, disconnect, release, release complete.

```
****************** L3 SUMMARY DECODE (adv_trn.txt) ****************

DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2903.528s
DSL:2 ?? <--      02              cr
DSL:2 ?? <--         ----0010 02  > callref_length
DSL:2 ?? <--      000f            call_ref16
DSL:2 ?? <--      05              mt
DSL:2 ?? <--         -0000101 05  > message_type (SETUP)
DSL:2 ?? -->
DSL:2 ?? -->                      ### DecEngine VER:1.36 TIME:2903.588s
DSL:2 ?? -->                          02              cr
DSL:2 ?? -->                             ----0010 02  > callref_length
DSL:2 ?? -->                          800f            call_ref16
DSL:2 ?? -->                          02              mt
DSL:2 ?? -->                             -0000010 02  > message_type (CALL PROCEEDING)
DSL:2 ?? -->
DSL:2 ?? -->                      ### DecEngine VER:1.36 TIME:2903.728s
DSL:2 ?? -->                          02              cr
DSL:2 ?? -->                             ----0010 02  > callref_length
DSL:2 ?? -->                          800f            call_ref16
DSL:2 ?? -->                          01              mt
DSL:2 ?? -->                             -0000001 01  > message_type (ALERTING)
DSL:2 ?? -->
DSL:2 ?? -->                      ### DecEngine VER:1.36 TIME:2906.128s
DSL:2 ?? -->                          02              cr
DSL:2 ?? -->                             ----0010 02  > callref_length
DSL:2 ?? -->                          800f            call_ref16
DSL:2 ?? -->                          07              mt
DSL:2 ?? -->                             -0000111 07  > message_type (CONNECT)
DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2909.548s
DSL:2 ?? <--      02              cr
DSL:2 ?? <--         ----0010 02  > callref_length
DSL:2 ?? <--      000f            call_ref16
DSL:2 ?? <--      45              mt
DSL:2 ?? <--         -1000101 45  > message_type (DISCONNECT)
DSL:2 ?? -->
DSL:2 ?? -->                      ### DecEngine VER:1.36 TIME:2909.608s
DSL:2 ?? -->                          02              cr
DSL:2 ?? -->                             ----0010 02  > callref_length
DSL:2 ?? -->                          800f            call_ref16
DSL:2 ?? -->                          4d              mt
DSL:2 ?? -->                             -1001101 4d  > message_type (RELEASE)
DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2909.628s
DSL:2 ?? <--      02              cr
DSL:2 ?? <--         ----0010 02  > callref_length
DSL:2 ?? <--      000f            call_ref16
DSL:2 ?? <--      5a              mt
DSL:2 ?? <--         -1011010 5a  > message_type (RELEASE COMPLETE)

****************** DETAIL DECODE (adv_trn.txt) ****************

DSL:2 ?? -->
```

> This section contains the 'message type' information of all messages.
>
> It allows you to see quickly the message flows captured in this trace.
>
> Full decode of messages can be found after this section.

> Message from attached ISDN device to Vega on interface DSL 2

> Message from Vega DSL 2 to attached ISDN device

> This section contains the full decode of the ISDN messages.

```
DSL:2 ?? -->                               ### DecEngine VER:1.36 TIME:2894.188s DELTA:0000.000s
DSL:2 ?? -->
DSL:2 ?? -->                               ************************
DSL:2 ?? -->                               * Layer 2 Q.921 decode *
DSL:2 ?? -->                               ************************
DSL:2 ?? -->
DSL:2 ?? -->                       02              octet2
DSL:2 ?? -->                           000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                           ------1- 01  > command_response
DSL:2 ?? -->                           -------0 00  > ext
DSL:2 ?? -->                       01              octet3
DSL:2 ?? -->                           0000000- 00  > tei
DSL:2 ?? -->                           -------1 01  > ext
DSL:2 ?? -->                       01              supervisory1 (RECEIVER READY)
DSL:2 ?? -->                       1f              supervisory2
DSL:2 ?? -->                           0001111- 0f  > N(R)
DSL:2 ?? -->                           -------1 01  > poll_final


DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2894.208s DELTA:0000.020s
DSL:2 ?? <--
DSL:2 ?? <--     ************************
DSL:2 ?? <--     * Layer 2 Q.921 decode *        Layer 2 messages are about link connectivity
DSL:2 ?? <--     ************************
DSL:2 ?? <--
DSL:2 ?? <--     02              octet2
DSL:2 ?? <--         000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--         ------1- 01  > command_response
DSL:2 ?? <--         -------0 00  > ext
DSL:2 ?? <--     01              octet3
DSL:2 ?? <--         0000000- 00  > tei
DSL:2 ?? <--         -------1 01  > ext
DSL:2 ?? <--     01              supervisory1 (RECEIVER READY)
DSL:2 ?? <--     25              supervisory2
DSL:2 ?? <--         0010010- 12  > N(R)
DSL:2 ?? <--         -------1 01  > poll_final


DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2903.528s DELTA:0009.320s
DSL:2 ?? <--
DSL:2 ?? <--     ************************
DSL:2 ?? <--     * Layer 2 Q.921 decode *
DSL:2 ?? <--     ************************
DSL:2 ?? <--
DSL:2 ?? <--     00              octet2
DSL:2 ?? <--         000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--         ------0- 00  > command_response
DSL:2 ?? <--         -------0 00  > ext
DSL:2 ?? <--     01              octet3
DSL:2 ?? <--         0000000- 00  > tei
DSL:2 ?? <--         -------1 01  > ext
DSL:2 ?? <--     1e              info_xfer1
DSL:2 ?? <--         0001111- 0f  > N(S)
DSL:2 ?? <--         ------0 00  > type (INFORMATION)
DSL:2 ?? <--     24              info_xfer2
DSL:2 ?? <--         0010010- 12  > N(R)
DSL:2 ?? <--         -------0 00  > poll_final


DSL:2 ?? <--     NETWORK:ETSI

DSL:2 ?? <-- 08              protocol_discriminator (Q.931/I.451)
DSL:2 ?? <--
DSL:2 ?? <--     ************************
```

```
DSL:2 ?? <--      * Layer 3 Q.931 decode *
DSL:2 ?? <--      *************************                    Layer 3 messages are the signalling messages
DSL:2 ?? <--
DSL:2 ?? <--      02              cr
DSL:2 ?? <--          ----0010 02  > callref_length
DSL:2 ?? <--      000f            call_ref16
DSL:2 ?? <--      05              mt
DSL:2 ?? <--          -0000101 05  > message_type (SETUP)
DSL:2 ?? <--
DSL:2 ?? <--      *************************
DSL:2 ?? <--      * Information Elements *
DSL:2 ?? <--      *************************
DSL:2 ?? <--
DSL:2 ?? <--      04              mie_id
DSL:2 ?? <--          -0000100 04  > mie_type (BEARER_CAPABILITIES)
DSL:2 ?? <--      03              mie_length
DSL:2 ?? <--          80              octet3
DSL:2 ?? <--             1------- 01  > ext
DSL:2 ?? <--             -00----- 00  > coding_standard (CCITT)
DSL:2 ?? <--             ---00000 00  > info_xfer_cap (SPEECH)
DSL:2 ?? <--          90              octet4
DSL:2 ?? <--             1------- 01  > ext
DSL:2 ?? <--             -00----- 00  > xfer_mode (CIRCUIT MODE)
DSL:2 ?? <--             ---10000 10  > info_xfer_rate (64KBPS)
DSL:2 ?? <--          a3              octet5
DSL:2 ?? <--             1------- 01  > ext
DSL:2 ?? <--             -01----- 01  > lyr1_ident
DSL:2 ?? <--             ---00011 03  > user_info_lyr1 (G.711 A-LAW)
DSL:2 ?? <--
DSL:2 ?? <--      6c              mie_id
DSL:2 ?? <--          -1101100 6c  > mie_type (CALLING_PARTY_NUMBER)
DSL:2 ?? <--      04              mie_length
DSL:2 ?? <--          80              octet3
DSL:2 ?? <--             1------- 01  > ext
DSL:2 ?? <--             -000---- 00  > type_of_number (UNKNOWN)
DSL:2 ?? <--             ----0000 00  > plan_id (UNKNOWN)
DSL:2 ?? <--          32 30 33        number_digits (203)
DSL:2 ?? <--
DSL:2 ?? <--      70              mie_id
DSL:2 ?? <--          -1110000 70  > mie_type (CALLED_PARTY_NUMBER)
DSL:2 ?? <--      05              mie_length
DSL:2 ?? <--          80              octet3
DSL:2 ?? <--             1------- 01  > ext
DSL:2 ?? <--             -000---- 00  > type_of_number (UNKNOWN)
DSL:2 ?? <--             ----0000 00  > plan_id (UNKNOWN)
DSL:2 ?? <--          35 30 30 37     number_digits (5007)
DSL:2 ?? <--

DSL:2 ?? -->
DSL:2 ?? -->                          ### DecEngine VER:1.36 TIME:2903.528s DELTA:0000.000s
DSL:2 ?? -->
DSL:2 ?? -->                          *************************
DSL:2 ?? -->                          * Layer 2 Q.921 decode *
DSL:2 ?? -->                          *************************
DSL:2 ?? -->
DSL:2 ?? -->                          00              octet2
DSL:2 ?? -->                             000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                             ------0- 00  > command_response
DSL:2 ?? -->                             -------0 00  > ext
DSL:2 ?? -->                          01              octet3
DSL:2 ?? -->                             0000000- 00  > tei
DSL:2 ?? -->                             -------1 01  > ext
DSL:2 ?? -->                          01              supervisory1 (RECEIVER READY)
```

```
DSL:2 ?? -->                              20              supervisory2
DSL:2 ?? -->                                  0010000- 10  > N(R)
DSL:2 ?? -->                                  -------0 00  > poll_final

DSL:2 ?? -->
DSL:2 ?? -->                              ### DecEngine VER:1.36 TIME:2903.588s DELTA:0000.060s
DSL:2 ?? -->
DSL:2 ?? -->                                  ***********************
DSL:2 ?? -->                                  * Layer 2 Q.921 decode *
DSL:2 ?? -->                                  ***********************
DSL:2 ?? -->
DSL:2 ?? -->                              02              octet2
DSL:2 ?? -->                                  000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                                  ------1- 01  > command_response
DSL:2 ?? -->                                  -------0 00  > ext
DSL:2 ?? -->                              01              octet3
DSL:2 ?? -->                                  0000000- 00  > tei
DSL:2 ?? -->                                  -------1 01  > ext
DSL:2 ?? -->                              24              info_xfer1
DSL:2 ?? -->                                  0010010- 12  > N(S)
DSL:2 ?? -->                                  -------0 00  > type (INFORMATION)
DSL:2 ?? -->                              20              info_xfer2
DSL:2 ?? -->                                  0010000- 10  > N(R)
DSL:2 ?? -->                                  -------0 00  > poll_final

DSL:2 ?? -->                              NETWORK:ETSI

DSL:2 ?? -->                          08              protocol_discriminator (Q.931/I.451)
DSL:2 ?? -->
DSL:2 ?? -->                                  ***********************
DSL:2 ?? -->                                  * Layer 3 Q.931 decode *
DSL:2 ?? -->                                  ***********************
DSL:2 ?? -->
DSL:2 ?? -->                              02              cr
DSL:2 ?? -->                                  ----0010 02  > callref_length
DSL:2 ?? -->                              800f            call_ref16
DSL:2 ?? -->                              02              mt
DSL:2 ?? -->                                  -0000010 02  > message_type (CALL PROCEEDING)
DSL:2 ?? -->
DSL:2 ?? -->                                  ***********************
DSL:2 ?? -->                                  * Information Elements *
DSL:2 ?? -->                                  ***********************
DSL:2 ?? -->
DSL:2 ?? -->                              18              mie_id
DSL:2 ?? -->                                  -0011000 18  > mie_type (CHANNEL_ID)
DSL:2 ?? -->                              03              mie_length
DSL:2 ?? -->                                a9              octet3
DSL:2 ?? -->                                    1------- 01  > ext
DSL:2 ?? -->                                    -0------ 00  > id_present (IMPLICIT)
DSL:2 ?? -->                                    --1----- 01  > int_type (OTHER)
DSL:2 ?? -->                                    ----1--- 01  > pref_excl (EXCLUSIVE)
DSL:2 ?? -->                                    -----0-- 00  > d_channel_ind (NOT D-
CHANNEL)
DSL:2 ?? -->                                    ------01 01  > info_chan_select (B1)
DSL:2 ?? -->                                83              octet32
DSL:2 ?? -->                                    1------- 01  > ext
DSL:2 ?? -->                                    -00----- 00  > coding_standard (CCITT)
DSL:2 ?? -->                                    ---0---- 00  > number_map (NUMBER)
DSL:2 ?? -->                                    ----0011 03  > chan_type (B-CHANNEL UNITS)
DSL:2 ?? -->                                81              octet33
DSL:2 ?? -->                                    1------- 01  > ext
DSL:2 ?? -->                                    -0000001 01  > channel_number
```

```
DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2903.608s DELTA:0000.020s
DSL:2 ?? <--
DSL:2 ?? <--        ************************
DSL:2 ?? <--        * Layer 2 Q.921 decode *
DSL:2 ?? <--        ************************
DSL:2 ?? <--
DSL:2 ?? <--        02              octet2
DSL:2 ?? <--           000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--           ------1- 01  > command_response
DSL:2 ?? <--           -------0 00  > ext
DSL:2 ?? <--        01              octet3
DSL:2 ?? <--           0000000- 00  > tei
DSL:2 ?? <--           -------1 01  > ext
DSL:2 ?? <--        01              supervisory1 (RECEIVER READY)
DSL:2 ?? <--        26              supervisory2
DSL:2 ?? <--           0010011- 13  > N(R)
DSL:2 ?? <--           -------0 00  > poll_final

DSL:2 ?? -->
DSL:2 ?? -->                        ### DecEngine VER:1.36 TIME:2903.728s DELTA:0000.120s
DSL:2 ?? -->
DSL:2 ?? -->                        ************************
DSL:2 ?? -->                        * Layer 2 Q.921 decode *
DSL:2 ?? -->                        ************************
DSL:2 ?? -->
DSL:2 ?? -->                        02              octet2
DSL:2 ?? -->                           000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                           ------1- 01  > command_response
DSL:2 ?? -->                           -------0 00  > ext
DSL:2 ?? -->                        01              octet3
DSL:2 ?? -->                           0000000- 00  > tei
DSL:2 ?? -->                           -------1 01  > ext
DSL:2 ?? -->                        26              info_xfer1
DSL:2 ?? -->                           0010011- 13  > N(S)
DSL:2 ?? -->                           -------0 00  > type (INFORMATION)
DSL:2 ?? -->                        20              info_xfer2
DSL:2 ?? -->                           0010000- 10  > N(R)
DSL:2 ?? -->                           -------0 00  > poll_final

DSL:2 ?? -->                        NETWORK:ETSI

DSL:2 ?? -->                        08              protocol_discriminator (Q.931/I.451)
DSL:2 ?? -->
DSL:2 ?? -->                        ************************
DSL:2 ?? -->                        * Layer 3 Q.931 decode *
DSL:2 ?? -->                        ************************
DSL:2 ?? -->
DSL:2 ?? -->                        02              cr
DSL:2 ?? -->                           ----0010 02  > callref_length
DSL:2 ?? -->                        800f            call_ref16
DSL:2 ?? -->                        01              mt
DSL:2 ?? -->                           -0000001 01  > message_type (ALERTING)
DSL:2 ?? -->
DSL:2 ?? -->                        ************************
DSL:2 ?? -->                        * Information Elements *
DSL:2 ?? -->                        ************************
DSL:2 ?? -->
DSL:2 ?? -->                        1e              mie_id
DSL:2 ?? -->                           -0011110 1e  > mie_type (PROGRESS_INDICATOR)
DSL:2 ?? -->                        02              mie_length
DSL:2 ?? -->                              80              octet3
```

```
DSL:2 ?? -->                                              1------- 01  > ext
DSL:2 ?? -->                                              -00----- 00  > coding_standard (CCITT)
DSL:2 ?? -->                                              ----0000 00  > location (USER)
DSL:2 ?? -->                                    88           octet4
DSL:2 ?? -->                                              1------- 01  > ext
DSL:2 ?? -->                                              -0001000 08  > description (IN-BAND TONE
AVAILABLE)


DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2903.748s DELTA:0000.020s
DSL:2 ?? <--
DSL:2 ?? <--      ***********************
DSL:2 ?? <--      * Layer 2 Q.921 decode *
DSL:2 ?? <--      ***********************
DSL:2 ?? <--
DSL:2 ?? <--      02            octet2
DSL:2 ?? <--         000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--         ------1- 01  > command_response
DSL:2 ?? <--         -------0 00  > ext
DSL:2 ?? <--      01            octet3
DSL:2 ?? <--         0000000- 00  > tei
DSL:2 ?? <--         -------1 01  > ext
DSL:2 ?? <--      01            supervisory1 (RECEIVER READY)
DSL:2 ?? <--      28            supervisory2
DSL:2 ?? <--         0010100- 14  > N(R)
DSL:2 ?? <--         -------0 00  > poll_final


DSL:2 ?? -->
DSL:2 ?? -->                          ### DecEngine VER:1.36 TIME:2906.128s DELTA:0002.380s
DSL:2 ?? -->
DSL:2 ?? -->                          ***********************
DSL:2 ?? -->                          * Layer 2 Q.921 decode *
DSL:2 ?? -->                          ***********************
DSL:2 ?? -->
DSL:2 ?? -->                          02            octet2
DSL:2 ?? -->                             000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                             ------1- 01  > command_response
DSL:2 ?? -->                             -------0 00  > ext
DSL:2 ?? -->                          01            octet3
DSL:2 ?? -->                             0000000- 00  > tei
DSL:2 ?? -->                             -------1 01  > ext
DSL:2 ?? -->                          28            info_xfer1
DSL:2 ?? -->                             0010100- 14  > N(S)
DSL:2 ?? -->                             -------0 00  > type (INFORMATION)
DSL:2 ?? -->                          20            info_xfer2
DSL:2 ?? -->                             0010000- 10  > N(R)
DSL:2 ?? -->                             -------0 00  > poll_final


DSL:2 ?? -->                          NETWORK:ETSI

DSL:2 ?? -->                          08            protocol_discriminator (Q.931/I.451)
DSL:2 ?? -->
DSL:2 ?? -->                          ***********************
DSL:2 ?? -->                          * Layer 3 Q.931 decode *
DSL:2 ?? -->                          ***********************
DSL:2 ?? -->
DSL:2 ?? -->                          02            cr
DSL:2 ?? -->                             ----0010 02  > callref_length
DSL:2 ?? -->                          800f          call_ref16
DSL:2 ?? -->                          07            mt
DSL:2 ?? -->                             -0000111 07  > message_type (CONNECT)
```

```
DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2906.148s DELTA:0000.020s
DSL:2 ?? <--
DSL:2 ?? <--     ***********************
DSL:2 ?? <--     * Layer 2 Q.921 decode *
DSL:2 ?? <--     ***********************
DSL:2 ?? <--
DSL:2 ?? <--     02              octet2
DSL:2 ?? <--         000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--         ------1- 01  > command_response
DSL:2 ?? <--         -------0 00  > ext
DSL:2 ?? <--     01              octet3
DSL:2 ?? <--         0000000- 00  > tei
DSL:2 ?? <--         -------1 01  > ext
DSL:2 ?? <--     01              supervisory1 (RECEIVER READY)
DSL:2 ?? <--     2a              supervisory2
DSL:2 ?? <--         0010101- 15  > N(R)
DSL:2 ?? <--         -------0 00  > poll_final


DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2909.548s DELTA:0003.400s
DSL:2 ?? <--
DSL:2 ?? <--     ***********************
DSL:2 ?? <--     * Layer 2 Q.921 decode *
DSL:2 ?? <--     ***********************
DSL:2 ?? <--
DSL:2 ?? <--     00              octet2
DSL:2 ?? <--         000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--         ------0- 00  > command_response
DSL:2 ?? <--         -------0 00  > ext
DSL:2 ?? <--     01              octet3
DSL:2 ?? <--         0000000- 00  > tei
DSL:2 ?? <--         -------1 01  > ext
DSL:2 ?? <--     20              info_xfer1
DSL:2 ?? <--         0010000- 10  > N(S)
DSL:2 ?? <--         -------0 00  > type (INFORMATION)
DSL:2 ?? <--     2a              info_xfer2
DSL:2 ?? <--         0010101- 15  > N(R)
DSL:2 ?? <--         -------0 00  > poll_final


DSL:2 ?? <--     NETWORK:ETSI

DSL:2 ?? <-- 08              protocol_discriminator (Q.931/I.451)
DSL:2 ?? <--
DSL:2 ?? <--     ***********************
DSL:2 ?? <--     * Layer 3 Q.931 decode *
DSL:2 ?? <--     ***********************
DSL:2 ?? <--
DSL:2 ?? <--     02              cr
DSL:2 ?? <--         ----0010 02  > callref_length
DSL:2 ?? <--     000f            call_ref16
DSL:2 ?? <--     45              mt
DSL:2 ?? <--         -1000101 45  > message_type (DISCONNECT)
DSL:2 ?? <--
DSL:2 ?? <--     ***********************
DSL:2 ?? <--     * Information Elements *
DSL:2 ?? <--     ***********************
DSL:2 ?? <--
DSL:2 ?? <--     08              mie_id
DSL:2 ?? <--         -0001000 08  > mie_type (CAUSE)
DSL:2 ?? <--     02              mie_length
DSL:2 ?? <--         80              octet3
DSL:2 ?? <--             1------- 01  > ext
```

```
DSL:2 ?? <--                  -00----- 00  > coding_standard (CCITT)
DSL:2 ?? <--                  ----0000 00  > location (USER)
DSL:2 ?? <--          90              octet4
DSL:2 ?? <--                  1------- 01  > ext
DSL:2 ?? <--                  -001---- 01  > class (NORMAL)
DSL:2 ?? <--                  ----0000 00  > value
DSL:2 ?? <--                  -0010000 10  > cause (NORMAL CALL CLEARING)


DSL:2 ?? -->
DSL:2 ?? -->                          ### DecEngine VER:1.36 TIME:2909.548s DELTA:0000.000s
DSL:2 ?? -->
DSL:2 ?? -->                          ************************
DSL:2 ?? -->                          * Layer 2 Q.921 decode *
DSL:2 ?? -->                          ************************
DSL:2 ?? -->
DSL:2 ?? -->                          00              octet2
DSL:2 ?? -->                             000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                             ------0- 00  > command_response
DSL:2 ?? -->                             -------0 00  > ext
DSL:2 ?? -->                          01              octet3
DSL:2 ?? -->                             0000000- 00  > tei
DSL:2 ?? -->                             -------1 01  > ext
DSL:2 ?? -->                          01              supervisory1 (RECEIVER READY)
DSL:2 ?? -->                          22              supervisory2
DSL:2 ?? -->                             0010001- 11  > N(R)
DSL:2 ?? -->                             -------0 00  > poll_final


DSL:2 ?? -->
DSL:2 ?? -->                          ### DecEngine VER:1.36 TIME:2909.608s DELTA:0000.060s
DSL:2 ?? -->
DSL:2 ?? -->                          ************************
DSL:2 ?? -->                          * Layer 2 Q.921 decode *
DSL:2 ?? -->                          ************************
DSL:2 ?? -->
DSL:2 ?? -->                          02              octet2
DSL:2 ?? -->                             000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                             ------1- 01  > command_response
DSL:2 ?? -->                             -------0 00  > ext
DSL:2 ?? -->                          01              octet3
DSL:2 ?? -->                             0000000- 00  > tei
DSL:2 ?? -->                             -------1 01  > ext
DSL:2 ?? -->                          2a              info_xfer1
DSL:2 ?? -->                             0010101- 15  > N(S)
DSL:2 ?? -->                             -------0 00  > type (INFORMATION)
DSL:2 ?? -->                          22              info_xfer2
DSL:2 ?? -->                             0010001- 11  > N(R)
DSL:2 ?? -->                             -------0 00  > poll_final

DSL:2 ?? -->                          NETWORK:ETSI

DSL:2 ?? -->                          08              protocol_discriminator (Q.931/I.451)
DSL:2 ?? -->
DSL:2 ?? -->                          ************************
DSL:2 ?? -->                          * Layer 3 Q.931 decode *
DSL:2 ?? -->                          ************************
DSL:2 ?? -->
DSL:2 ?? -->                          02              cr
DSL:2 ?? -->                             ----0010 02  > callref_length
DSL:2 ?? -->                          800f            call_ref16
DSL:2 ?? -->                          4d              mt
DSL:2 ?? -->                             -1001101 4d  > message_type (RELEASE)
```

```
DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2909.628s DELTA:0000.020s
DSL:2 ?? <--
DSL:2 ?? <--      ************************
DSL:2 ?? <--      * Layer 2 Q.921 decode *
DSL:2 ?? <--      ************************
DSL:2 ?? <--
DSL:2 ?? <--      00              octet2
DSL:2 ?? <--         000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--         ------0- 00  > command_response
DSL:2 ?? <--         -------0 00  > ext
DSL:2 ?? <--      01              octet3
DSL:2 ?? <--         0000000- 00  > tei
DSL:2 ?? <--         -------1 01  > ext
DSL:2 ?? <--      22              info_xfer1
DSL:2 ?? <--         0010001- 11  > N(S)
DSL:2 ?? <--         -------0 00  > type (INFORMATION)
DSL:2 ?? <--      2c              info_xfer2
DSL:2 ?? <--         0010110- 16  > N(R)
DSL:2 ?? <--         -------0 00  > poll_final

DSL:2 ?? <--      NETWORK:ETSI

DSL:2 ?? <-- 08             protocol_discriminator (Q.931/I.451)
DSL:2 ?? <--
DSL:2 ?? <--      ************************
DSL:2 ?? <--      * Layer 3 Q.931 decode *
DSL:2 ?? <--      ************************
DSL:2 ?? <--
DSL:2 ?? <--      02              cr
DSL:2 ?? <--         ----0010 02  > callref_length
DSL:2 ?? <--      000f            call_ref16
DSL:2 ?? <--      5a              mt
DSL:2 ?? <--         -1011010 5a  > message_type (RELEASE COMPLETE)


DSL:2 ?? -->
DSL:2 ?? -->                      ### DecEngine VER:1.36 TIME:2909.628s DELTA:0000.000s
DSL:2 ?? -->
DSL:2 ?? -->                           ************************
DSL:2 ?? -->                           * Layer 2 Q.921 decode *
DSL:2 ?? -->                           ************************
DSL:2 ?? -->
DSL:2 ?? -->                           00              octet2
DSL:2 ?? -->                              000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? -->                              ------0- 00  > command_response
DSL:2 ?? -->                              -------0 00  > ext
DSL:2 ?? -->                           01              octet3
DSL:2 ?? -->                              0000000- 00  > tei
DSL:2 ?? -->                              -------1 01  > ext
DSL:2 ?? -->                           01              supervisory1 (RECEIVER READY)
DSL:2 ?? -->                           24              supervisory2
DSL:2 ?? -->                              0010010- 12  > N(R)
DSL:2 ?? -->                              -------0 00  > poll_final


DSL:2 ?? -->
DSL:2 ?? -->                      ### DecEngine VER:1.36 TIME:2919.628s DELTA:0010.000s
DSL:2 ?? -->
DSL:2 ?? -->                           ************************
DSL:2 ?? -->                           * Layer 2 Q.921 decode *
DSL:2 ?? -->                           ************************
DSL:2 ?? -->
DSL:2 ?? -->                           02              octet2
DSL:2 ?? -->                              000000-- 00  > sapi (CALL CONTROL)
```

```
DSL:2 ?? -->                                    ------1- 01  > command_response
DSL:2 ?? -->                                    -------0 00  > ext
DSL:2 ?? -->                           01           octet3
DSL:2 ?? -->                               0000000- 00  > tei
DSL:2 ?? -->                               -------1 01  > ext
DSL:2 ?? -->                           01           supervisory1 (RECEIVER READY)
DSL:2 ?? -->                           25           supervisory2
DSL:2 ?? -->                               0010010- 12  > N(R)
DSL:2 ?? -->                               -------1 01  > poll_final

DSL:2 ?? <--
DSL:2 ?? <-- ### DecEngine VER:1.36 TIME:2919.648s DELTA:0000.020s
DSL:2 ?? <--
DSL:2 ?? <--      ***********************
DSL:2 ?? <--      * Layer 2 Q.921 decode *
DSL:2 ?? <--      ***********************
DSL:2 ?? <--
DSL:2 ?? <--      02           octet2
DSL:2 ?? <--          000000-- 00  > sapi (CALL CONTROL)
DSL:2 ?? <--          ------1- 01  > command_response
DSL:2 ?? <--          -------0 00  > ext
DSL:2 ?? <--      01           octet3
DSL:2 ?? <--          0000000- 00  > tei
DSL:2 ?? <--          -------1 01  > ext
DSL:2 ?? <--      01           supervisory1 (RECEIVER READY)
DSL:2 ?? <--      2d           supervisory2
DSL:2 ?? <--          0010110- 16  > N(R)
DSL:2 ?? <--          -------1 01  > poll_final
```

Layer 2 message decode (Euro, DMS)

General format:

8	7	6	5	4	3	2	1
Flag = 7E							
0	1	1	1	1	1	1	0
SAPI						Cmd/Resp	EA
TEI							EA
Control							
Control (optional)							
Information (optional)							
…							
Information (optional)							
FCS (octet 1) - sumcheck							
FCS (octet 2) - sumcheck							
Flag = 7E							
0	1	1	1	1	1	1	0

SAPI:

- 0 = Call Control Procedures
- 1 = Reserved for packet comms over Q.931
- 16 = Packet comms using X.25 level 3
- others = Reserved

Cmd/Resp:

- User → Network: 0=Command, 1=Response
- Network → User: 0=Response, 1=Command

EA – Address field Extension:

- 0 = NOT final address octet
- 1 = Final address octet

TEI:

- 127 (0x7F) = Broadcast
- 0 to 63 = Non-automatic TEI assignment (User selected)
- 64 to 126 = Automatic TEI assignment (Network provided)

I-Format (Information transfer)

8	7	6	5	4	3	2	1
Control							
Control (optional)							
Information (optional)							
…							
Information (optional)							

→

8	7	6	5	4	3	2	1
N(S) – transmitter send sequence ID MOD 128							0
N(R) – transmitter receive sequence ID MOD 128							Poll
Information (optional)							
…							
Information (optional)							

Commands:

- Information transfer for layer 3 messages
  - Information fields contain the layer 3 message

S-Format (Supervisory)

8	7	6	5	4	3	2	1
Control							
Control (optional)							
Information (optional)							
…							
Information (optional)							

→

8	7	6	5	4	3	2	1
0	0	0	0	S	S	0	1
N(R) – transmitter receive sequence ID MOD 128							Poll / Final

Commands:

- RR – Receiver Ready

- RNR – Receiver Not Ready

- REJ – Reject

RR (0x01)

8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	1
N(R) – transmitter receive sequence ID MOD 128							Poll / Final

RNR (0x05)

8	7	6	5	4	3	2	1
0	0	0	0	0	1	0	1
N(R) – transmitter receive sequence ID MOD 128							Poll / Final

REJ (0x09)

8	7	6	5	4	3	2	1
0	0	0	0	1	0	0	1
N(R) – transmitter receive sequence ID MOD 128							Poll / Final

U-Format

8	7	6	5	4	3	2	1
Control							
Control (optional)							
Information (optional)							
…							
Information (optional)							

→

8	7	6	5	4	3	2	1
M	M	M	Poll / Final	M	M	1	1
Information (optional)							
…							
Information (optional)							

Poll / Final:

- Poll – used on commands; P=1 polls a response from the far end

- Final – used on responses; F=1 indicates a response to a Poll request

Commands:

- SABME – Set Asynchronous Balanced Mode Extended

- DM – Disconnected Mode

- UI – Unnumbered Information

- DISC – Disconnect
- UA – Unnumbered Acknowledge
- FRMR – Frame Reject
- XID – Exchange Identification Note

SABME – Command (0x6F or 0x7F)

8	7	6	5	4	3	2	1
0	1	1	Poll	1	1	1	1

DM – Response (0x0F or 0x1F)

8	7	6	5	4	3	2	1
0	0	0	Final	1	1	1	1

UI – Command (0x03 or 0x13)

8	7	6	5	4	3	2	1
0	0	0	Poll	0	0	1	1

DISC – Command (0x43 or 0x53)

8	7	6	5	4	3	2	1
0	1	0	Poll	0	0	1	1

UA – Response (0x63 or 0x73)

8	7	6	5	4	3	2	1
0	1	1	Final	0	0	1	1

Euro: FRMR – Response (0x83 or 0x93)

8	7	6	5	4	3	2	1
1	0	0	Final	0	0	1	1
Information (optional)							
…							
Information (optional)							

The information section contains the 5 octets of the rejected frame

DMS: FRMR – Response (0x87 or 0x97)

8	7	6	5	4	3	2	1
1	0	0	Final	0	1	1	1
Information (optional)							
…							
Information (optional)							

The information section contains the 5 octets of the rejected frame

XID – Command or response (0xAF or 0xBF)

_8_	_7_	_6_	_5_	_4_	_3_	_2_	_1_
1	0	1	Poll / Final	1	1	1	1
Information (optional)							
…							
Information (optional)							

Layer 3 ISDN message decode (Euro, DMS)

8	7	6	5	4	3	2	1
Protocol Discriminator							
0	0	0	0	Length of Call reference value (in octets)			
Call Reference Information Element							
0	Message Type						
Other information elements as required							

Protocol Discriminator values

8	7	6	5	4	3	2	1		
0	0	0	0	0	0	0	0	00	
		thru						thru	Not valid values for Protocol discriminator
0	0	0	0	0	0	1	0	02	
0	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**03**	**DMS: Maintenance messages**
0	0	0	0	0	1	0	0	04	
		thru						thru	Not valid values for Protocol discriminator
0	0	0	0	0	1	1	1	07	
0	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**08**	**Q931 / I.451 user-network call control messages**
0	0	0	1	0	0	0	0	10	
		thru						thru	Reserved for other network layer, or layer 3
0	0	0	1	1	1	1	1	1F	protocols
0	1	0	0	0	0	0	0	40	
		thru						thru	National use
0	1	0	0	1	1	1	1	4F	
0	1	0	1	0	0	0	0	50	
		thru						thru	Reserved for other network layer or layer 3
1	1	1	1	1	1	1	1	FF	protocols

Call Reference Information Element

8	7	6	5	4	3	2	1
0	0	0	0	Length of call reference value in octets			
X	Call reference value (MS data)						
Call reference value (less significant data) ….							

X = 0; Message is sent from the side that originates the call reference

X = 1; Message is sent to the side that originates the call reference

Dummy Call Reference – used in non call related messages

8	7	6	5	4	3	2	1
				Length of call reference value in octets			
0	0	0	0	0	0	0	0

(Same as Call Reference Information Element – 0 length)

DMS: Global Call Reference – used to address all calls whatever there call reference

1 octet version:

8	7	6	5	4	3	2	1
				Length of call reference value in octets			
0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0

2 octet version:

8	7	6	5	4	3	2	1
				Length of call reference value in octets			
0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Q.931/Q.932 Message types for protocol discriminator = Q.931 = 0x08

8	7	6	5	4	3	2	1			
0	0	0	-	-	-	-	-			*Call Establishment*
			0	0	0	0	1		01	Alerting
			0	0	0	1	0		02	Call Proceeding
			0	0	0	1	1		03	Progress
			0	0	1	0	1		05	Setup
			0	0	1	1	1		07	Connect
			0	1	1	0	1		0D	Setup Acknowledge
			0	1	1	1	1		0F	Connect Acknowledge
0	0	1	-	-	-	-	-			*Call Information Phase*
			0	0	0	0	0		20	User Information
			0	0	0	0	1		21	Suspend Reject
			0	0	0	1	0		22	Resume reject
			0	0	1	0	0		24	Hold
			0	0	1	0	1		25	Suspend
			0	0	1	1	0		26	Resume
			0	1	0	0	0		28	Hold Acknowledge
			0	1	1	0	1		2D	Suspend Acknowledge
			0	1	1	1	0		2E	Resume Acknowledge
			1	0	0	0	0		30	Hold Reject
			1	0	0	0	1		31	Retrieve
			1	0	0	1	1		33	Retrieve Acknowledge
			1	0	1	1	1		37	Retrieve Reject
0	1	0	-	-	-	-	-			*Call Clearing*
			0	0	1	0	1		45	Disconnect
			0	0	1	1	0		46	Restart
			0	1	1	0	1		4D	Release
			0	1	1	1	0		4E	Restart Acknowledge
			1	1	0	1	0		5A	Release Complete
0	1	1	-	-	-	-	-			*Miscellaneous*
			0	0	0	0	0		60	Segment
			0	0	0	1	0		62	Facility
			0	0	1	0	0		64	Register
			0	1	1	1	0		6E	Notify
			1	0	0	1	0		72	DMS: Facility Reject
			1	0	1	0	1		75	Status Enquiry
			1	1	0	0	1		79	Congestion Control
			1	1	0	1	1		7B	Information
			1	1	1	0	1		7D	Status

Message types for protocol discriminator = DMS: Maintenance messages = 0x03

8	7	6	5	4	3	2	1			
0	0	0	-	-	-	-	-			*Maintenance*
			0	0	1	1	1		07	Service Acknowledge
			0	1	1	1	1		0F	Service

Q.931 Information Element Identifiers

8	7	6	5	4	3	2	1				Note
1	:	:	:	-	-	-	-			*Single octet information elements*	3
	0	0	0	-	-	-	-		8x	Reserved	1
	0	0	1	-	-	-	-		9x	Shift	1
	0	1	0	0	0	0	0		A0	More Data	1
	0	1	0	0	0	0	1		A1	Sending Complete	1
	0	1	1						Bx	Congestion level	1
	1	0	1						Dx	Repeat Indicator	1
0	-	-	-	-	-	-	-			*Variable length information elements*	4
	0	0	0	0	0	0	0		00	Segmented message	2
	0	0	0	0	0	0	1		01	DMS: Change Status	2
	0	0	0	0	1	0	0		04	Bearer capability	2
	0	0	0	1	0	0	0		08	Cause	2
	0	0	0	1	1	0	0		0C	DMS: Connected number	2
	0	0	1	0	0	0	0		10	Call Identity	2
	0	0	1	0	1	0	0		14	Call State	2
	0	0	1	1	0	0	0		18	Channel Identification	2
	0	0	1	1	1	0	0		1C	Facility	2
	0	0	1	1	1	1	0		1E	Progress indicator	2
	0	1	0	0	0	0	0		20	Network Specific Facilities	2
	0	1	0	0	1	1	1		27	Notification Indicator	2
	0	1	0	1	0	0	0		28	Display	2
	0	1	0	1	0	0	1		29	Date / Time	2
	0	1	0	1	1	0	0		2C	Keypad Facility	2
	0	1	1	0	0	1	0		32	DMS: Information Request	2
	0	1	1	0	1	0	0		34	Signal	2
	0	1	1	0	1	1	0		36	Switchhook	2
	0	1	1	1	0	0	0		38	Feature activation	2
	0	1	1	1	0	0	1		39	Feature Indication	2
	1	0	0	0	0	0	0		40	Information Rate	2
	1	0	0	0	0	1	0		42	End-to-end Transit Delay	2
	1	0	0	0	0	1	1		43	Transit Delay Selection and Indication	2
	1	0	0	0	1	0	0		44	Packet Layer Binary Parameters	2
	1	0	0	0	1	0	1		45	Packet Layer Window Size	2
	1	0	0	0	1	1	0		46	Packet Size	2
	1	1	0	1	1	0	0		6C	Calling Party Number	2
	1	1	0	1	1	0	1		6D	Calling Party Sub-address	2

1	1	1	0	0	0	0	70	Called Party Number	2
1	1	1	0	0	0	1	71	Called Party Sub-address	2
1	1	1	0	0	1	1	73	DMS: Original Called Number	2
1	1	1	0	1	0	0	74	Redirecting Number	2
1	1	1	0	1	1	0	76	DMS: Redirection number	2
1	1	1	1	0	0	0	78	Transit Network Selection	2
1	1	1	1	0	0	1	79	Restart Indicator	2
1	1	1	1	1	0	0	7C	Low Layer Compatibility	2
1	1	1	1	1	0	1	7D	High Layer Compatibility	2
1	1	1	1	1	1	0	7E	User – User	2
1	1	1	1	1	1	1	7F	Escape for extension	2
Other values								RESERVED	

Note 1:   Single byte information element

Note 2:   2nd byte contains length of following data, e.g. [IE ID] [Count = 3] [data 1] [data 2] [data 3] … so a length of 3 results in a 5 byte message

Note 3:   Msbit of IE ID is set if it is a single byte IE

Note 4:   Msbit of IE ID is 0 if it is a variable length IE