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Contents

Foreword

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1 Scope

The present document specifies the signalling transport related to RETAP and TMAAP signalling to be used across the Iuant interface for UTRAN, E-UTRAN and NG-RAN. In this specification UTRAN, E-UTRAN and NG-RAN are denoted as "RAN", whereas the corresponding network entities Node B, eNB, en-gNB and NG-RAN node are denoted as "RAN Node". The logical Iuant interface is an interface internal to the RAN Node and defined to reside between the implementation specific O&M function and the RET antennas and between the implementation specific O&M function and the TMA control unit function.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] Void

[2] ISO/IEC 13239 (3rd Edition, 2002-07): "Information Technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures".

[3] 3GPP TS 37.461: "Iuant Interface: Layer 1".

[4] Antenna Interface Standards Group: "Control Interface for Antenna Line Devices", Standard No. AISG v2.0

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

ASCII character: A character forming part of the International Reference Version of the 7-bit character set defined in ISO/IEC 646:1991 represented as one octet

Octet: 8 bits as used in ISO/IEC 13239 [2]

Device type: One octet identifying the type of a device

Unique ID: A concatenation of the vendor code (2 octets) and a 1 to 17 octets long unit specific code (e.g. serial number) exclusive for each secondary device from the vendor to whom the vendor code is assigned. The vendor code is placed in the left-most (most significant) position of the unique ID. The vendor to whom the vendor code is assigned is responsible for ensuring the uniqueness of the unique ID for each device.

Vendor code: A unique ASCII 2-character code assigned to each vendor in AISG v2.0 [4].

Reset: A process by which the device is put in the state it reaches after a completed power-up

SecondaryPayloadTransmitLength: The maximum length of the INFO field of an HDLC I-frame in the direction secondary device to primary device.

SecondaryPayloadReceiveLength: The maximum length of the INFO field of an HDLC I-frame in the direction primary device to secondary device.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADDR	Address
ACK	Acknowledgment
CRC	Cyclic Redundancy Check
DISC	Disconnect (frame type)
DM	Disconnected Mode (frame type)
FCS	Frame Checking Sequence
FI	Format Identifier
FRMR	Frame Reject (frame type)
GI	Group Identifier
GL	Group Length
HDLC	High-Level Data Link Control
I	Information (frame type)
ID	Identifier
INFO	Information (field name)
NAK	Non Acknowledgment
NRM	Normal Response Mode
P/F	Poll/Final
PI	Parameter Identifier
PL	Parameter Length
PV	Parameter Value
RET	Remote Electrical Tilting
RETAP	Remote Electrical Tilting Application Part
RNR	Receive Not Ready (frame type)
RR	Receive Ready (frame type)
SNRM	Set Normal Response Mode (frame type)
TMA	Tower Mounted Amplifier
TMAAP	Tower Mounted Amplifier Application Part
TWA	Two Way Alternate
UA	Unnumbered Acknowledgement (frame type)
UNC	Unbalanced Operation Normal Response Mode Class
XID	Exchange ID (frame type)

4 Iuant data link layer

The Data Link Layer uses HDLC Class UNC1,15.1 TWA (see 6.10 in ISO/IEC 13239 [2]) according to ISO/IEC 13239 [2].

4.1 Invalid receptions

Frames shall be discarded if a framing error or data overrun occurs.

4.2 Frame lengths

HDLC frame lengths may vary between 4 and N octets.

All secondary devices shall support an N of 78 octets. A secondary device may, after XID negotiation, support a larger N.

4.3 Default address

After reset, a secondary device shall use the no-device address (0x00). While it has the no-device address, it may only respond to device scan and address assignment messages, but any broadcast messages shall be evaluated without response.

4.4 Window size

All devices shall support a window size of 1. A device may, after XID negotiation, support any window size up to 7.

4.5 Message timing

A minimum of 3 ms shall elapse between receiving and transmitting messages.

A secondary device shall, after reception of a command with the P/F bit set, start transmitting a response within 10 ms from the time the final flag octet of that command frame was received.

The transmission of the response shall be finalised within the time t= n*10*4/datarate where n is the number of octets in the response frame including all HDLC framing overhead. The maximum gap time between two consecutive octets shall not exceed the time t= 3*10/datarate. This corresponds to a 25% utilisation of the Data Link Layer.

The data rate is specified in TS 37.461 [3].

4.6 State model

The connection state model for the layer 2 of the secondary device is shown in figure 4.1. The events written in *italic* are procedures from higher levels e.g. link establishment. The HDLC frames that correspond to the events are written in bold as **command / response** messages.

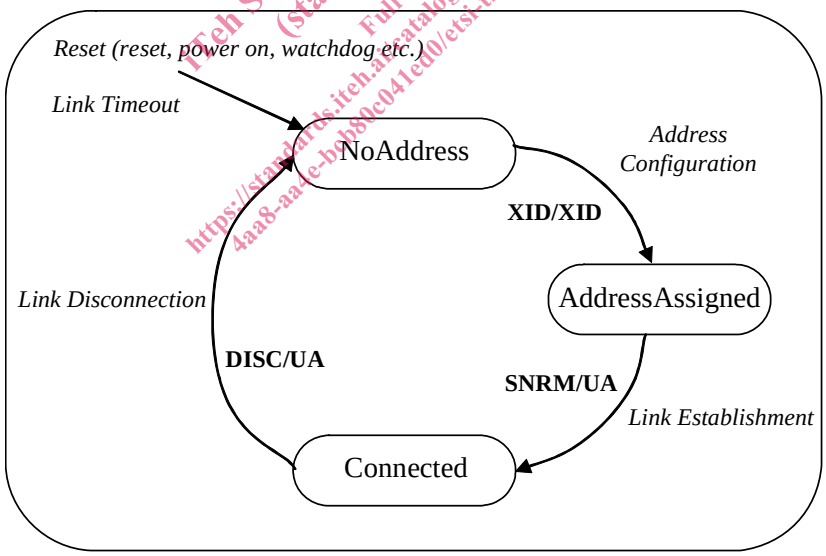

Figure 4.6.1: Connection state model

4.7 Device types

Three device types are defined and identified by the assigned 1-octet unsigned integer code.

Table 4.7.1: Device types and codes

Device Type	1-octet unsigned integer code
Single-Antenna RET Device	0x01
Multi-Antenna RET Device	0x11
Tower mounted amplifier (TMA)	0x02

4.8 XID negotiation

XID negotiation shall use the standard format (see 5.5.3.1-5.5.3.2.3.2 in ISO/IEC 13239 [2]). See Annex B for a brief description of XID negotiation and Annex C to E for examples of XID negotiations. All GL fields have a size of 1 octet.

Any parameter combination of 4.8.1 (HDLC parameter), 4.8.2 (Protocol Version) and 4.8.3 (Address assignment) in an XID command shall be supported by all secondary devices.

4.8.1 HDLC parameters

Format Identifier (FI) shall be 0x81 and Group Identifier (GI) shall be 0x80. All secondary devices shall support the following parameters:

Table 4.8.1.1: HDLC parameters for secondary devices

PI	PL	Description of PV
5	4	Maximum information field length – transmit (bits)
6	4	Maximum information field length – receive (bits)
7	1	Window size – transmit (frames)
8	1	Window size – receive (frames)

The SecondaryPayloadTransmitLength shall be 74 octets by default. It can be increased via XID negotiation, but shall always be 74 octets or larger.

The SecondaryPayloadReceiveLength shall be 74 octets by default. It can be increased via XID negotiation, but shall always be 74 octets or larger.

4.8.2 Protocol version

Format Identifier (FI) shall be 0x81 and Group Identifier (GI) shall be 0xF0. All secondary devices shall support the following parameter:

Table 4.8.2.1: HDLC parameter for protocol version

PI	PL	Description of PV
5	1	3GPP Release ID

4.8.3 Address assignment

The primary device broadcasts the XID commands. The secondary device(s) which match shall respond. The primary shall ensure that only one secondary matches the supplied parameter(s). See below for details.

Format Identifier (FI) shall be 0x81 and Group Identifier (GI) shall be 0xF0. All secondary devices shall support the following parameters:

Table 4.8.3.1: HDLC parameters for address assignment and device scan

PI	PL	Description of PV
1	0 to 19	Unique ID
2	1	HDLC Address
3	0 to 19	Bit Mask (for Unique ID), indicates a device scan
4	1	Device Type (see table 4.7.1)
6	2	Vendor Code as given in AISG v2.0 [4]

The XID message can be used to assign HDLC addresses or to scan for devices.

An address assignment XID command shall contain at least PI=2 (HDLC Address) and shall not contain PI=3 (Bit Mask). During an address assignment all secondary devices first assume a match and then carry out the following steps:

- If PI=1 (Unique ID) is supplied, the right-most PL octets of the secondary devices Unique ID are compared to the Unique ID in the XID command. If they are different, the secondary device does not match, and the message is ignored. If the Unique ID in the XID command is longer than the secondary devices Unique ID, the secondary device does not match, and the message is ignored.

- If PI=4 (Device Type) is supplied, the device type of the secondary device is compared to the device type in the XID command. If they are different, the secondary device does not match, and the message is ignored.

- If PI=6 (Vendor Code) is supplied, the vendor code of the secondary device is compared to the vendor code in the XID command. If they are different, the secondary device does not match, and the message is ignored.

If the secondary device still matches after these steps, the secondary device sets its HDLC address to the address specified in PI=2 and responds with an XID response which contains PI=1 and PI=4.

NOTE: Unlike the normal XID negotiation, in this XID negotiation, the XID response message returns a different set of parameters than the XID command message.

4.8.4 Device scan

The device scan messages may be utilised by the primary to identify all secondary stations in the NoAddress state on an interface .

A device scan XID command shall only contain PI=1 (Unique ID) and PI=3 (Bit Mask), see table 4.8.3.1. PI=1 and PI=3 shall be of equal length PL octets.

If in the NoAddress state, the secondary device masks the min(PL,2) left-most octets of its own unique ID with the min(PL,2) left-most octets of the bit mask in the XID command and compares the result with the min(PL,2) left-most octets the unique ID supplied in the XID command. If they match, the secondary device masks the max(0,PL-2) right-most octets of its own unique ID with the max(0,PL-2) right-most octets of the bit mask in the XID command and compares the result with the max(0,PL-2) right-most octets of the unique ID supplied in the XID command. If they also match, the secondary device transmits an XID response message with its own identification data in the fields PI=1 (complete unique ID), PI=4 (device type) and PI=6 (vendor code).

For the device scan comparison, the unique ID of the secondary device shall be padded with NUL characters (character code 0x00) between the second and third left-most positions to a length of 19 octets.

The scan command with zero length (PL=0) of the Unique ID (PI=1) and the Bit Mask (PI=3) shall match all secondary devices in the NoAddress state.

Only matching secondary devices in the NoAddress state shall respond to the device scan messages.

4.8.5 Reset device

Format identifier (FI) shall be 0x81 and group identifier (GI) shall be 0xF0. All secondary devices shall support the following parameter: