VDL4 Manual Part II: Other Clarifications originating from the EUROCAE review

1.Introduction

During the course of reviewing the VDL4 Manual material, the reviewing parties identified a number of instances where clarification of the text was required. The issues were collated throughout this activity and presented/circulated for discussion and approval by members of the EUROCAE WG-51/SG2 team for inclusion in the VDL4 Technical Manual. This document summarises the agreed changes and presents for reference the resulting change proposals.

2.Change proposals agreed by the VDL/4 MOPS development subgroup

2.1 Harmonisation of terms

Changing of the term "frame" to "DLPDU" or "burst" as appropriate. This is documented in a SG2 action paper presented to the group.

changing of “compressed frame bursts” with “DLS bursts” in the burst format section notes (1.3.2)

changing of the term ”byte” to “octet” throughout the text.

Harmonisation of variants of the term “Synchronisation burst” including “sync” and “synch” and a clarification to the text of the definition of the synchronisation burst in Section 1.1.3.

2.2 Agreed proposals originating from ADSI

ADSI have raised a number of issues that arose during the evaluation of the DLS text and other parts of the Manual. A number of proposals were documented and presented to SG2 in the Toulouse meeting (9-11 September 2003). A summary of the agreed changes are provided below:

2.2.1 Completion of the Broadcast Connection parameter

Parameter 4C (broadcast connection) missing from second and third table of Table 1-97. It should be N/A except for the ground requested broadcast handoff where it is mandatory.

2.2.2 CTRL sequence parameter encoding

In Table 1-71i, bit 4 should be denoted s_4 and not zero.

2.2.3 Abbreviated CTRL names

A row for CTRL_CMD_LE should be inserted in Table 1-71g.

2.2.4 TL2 text is unclear

The text in Section 1.5.4.3 is unclear. Specific guidance when to set, reset, and clear the timer is missing. The text should be checked for basic grammatical consistency and should include a requirement to set the timer after receipt of the CTRL_ACK from the last fragment of the CTRL frame, never reset the timer, and clear the timer upon receipt of the complete CTRL_RSP. Finally, the text should be cleaned up.

2.2.5 CTRL Parameter Order

For CTRL implementation simplicity, we should restrict parameters to monotonically non-decreasing order (except for parameter ID 00, which must go last). In particular, since most receive application are going to be searching for parameters 01 and 02 for initial processing, these should be easiest to find. Add a sentence at the end of the first paragraph of Section 1.5.3.1 "Except for parameter ID 00 (which must appear last), the parameters in a CTRL DLPDU shall be listed in non-decreasing numeric order."

2.2.6 Missed indicate anachronism

Section 1.5.4.1, note 3 should be updated to include the effects of TL3. This note was written before TL3 reduced most of the effects of short-term outages.
Note 3.— The timeliness of the generation of leave events depends on the value of the L1 counter and the number of reservations known to have been made by a station within a time interval. If the ~~L1~~TL3 timer~~counter~~ is set to a low value then a ~~leave event may be generated when a~~ string of messages closely spaced in time that are~~is~~ lost due to aircraft banking, antenna shadowing effects and interference may be considered as independent indicators. If the L1 counter or the TL3 timer is set too low, then a leave event may be generated incorrectly. A ground station can readjust the L1 counter and TL3 timer with the CTRL parameter defined in section 1.5.4.3.9 in order to minimise the likelihood of a leave event false alarm.

2.2.7 Nearest airport usage in GSIF

In Table 1-97 (section 1.5.6), the GSIF column should have nearest airport as mandatory with a superscript 1 and have the ATN router NETs as either mandatory or optional, but without the superscript 1. The superscript 1 applies to the airport coverage and nearest airport parameter. The same is true of superscript 2 in the air-initiated-link establishment / new ground station column.

2.2.8 Requirements lacking a shall

The following sections have sentences that lack a shall and should be rewritten accordingly: Sections 1.5.2.5, 1.5.2.6, 1.5.3.1, 1.5.3.4.1, 1.5.3.5.5, 1.5.3.5.7, 1.5.3.5.8, 1.5.3.5.12, 1.5.3.6.5, 1.5.5.3.1.1, 1.5.5.3.2, 1.5.7.8.1, 1.5.7.10, 3.2, 3.3, 3.7.2.7, 3.7.2.9, 4.10.3.3. Some sentences should be downgraded to a note, while others should be rewritten to include a shall.

2.2.9 Directory of Service encoding

Text in table 1-85 is confusing in that it refers to bits 0, 1 and 2 of ai in the final three rows but to bits 1, 2 and 3 of ai in the ai definition row. Firstly, the numbering in the final three rows should be changed 0 to 1, 1 to 2 and 2 to 3. This is then consistent with how we number bits elsewhere. ai = 00X – no application fields ai = 110 – several application fields present as defined by anum, ai = 10X – one application field present and anum missing. The text should state that if bit 2 = 0 then the whole of the octet containing ai is missed out. Also ai = 01x is illegal. Thus, the only question is what ai=111 means. If it is illegal, then ai bits 2 and 3 are redundant (what would it mean if they differ)? If ai=111 has a meaning distinct from ai=110, then what is that meaning?

2.2.10 Generalisation of the a/d bit

One of the design goals in moving the a/d bit to bit 1 of octet 1 was to clean up the layering separation by letting the VSS operate only on VSS data without requiring any upper layer data.Thus, the a/d bit would be set based on any transmission and quarantining would be determined solely by the reservation type and the a/d bit (and pointedly without regard to the message id).

2.2.11 Plea response

In Section 3.4.3 note 2, 20 octets should be 19 octets. It then appears that synchronisation burst request message is one octet too long. One way to solve the problem is to reduce the size of the message ID field (actually the MAC service access point) and combine octets 5 and 6 in the Tables of Section 3.4.3.

2.2.12 Editorial Issues

A number of typographical errors were identified, documented and corrected in the Manual. A number of other editorial issues that were rectified include:

In Table 1-9, Q5mult (both the default and increment) should be in units of seconds. The values for Q5min and Q5max might be better if they were aligned with a slot size (i.e., 13.33 msec). Also, the increment for Q5wait is in seconds.

As part of the inclusion of the VDL/2 parameters, the LME parameters in Table 1-88 were renamed from TG1-5 to TL1-3. Plea parameters TG6 and TG7 should be renamed either as TL4/5 or TP1/2. (similarly with plea counters).

Some tables in section 1.5.3 have horizontal line separators while most others do not. Harmonize the table format.

2.3 Agreed proposals originating from Helios Technology

During the course of the VDL4 MOPS development work, the development team raised a number of points that were documented and presented for discussion in SG2. The following points describe the changes that were agreed in this process:

Clause “Note.- The encoding of the ground......Table 3-13” should not be a note. Replace note with: “The encoding of the ground speed subfield shall be as defined in Table 3-13.”

In Section 3.5, what is the requirement if there is only one GSC, or more than two GSCs. It is assumed that two GSCs will always be available. But what if the DOS message signals that there are three. It is proposed to make the following recommendation in a new section 3.5.1: “A station should aim to distribute its transmissions evenly between the two GSCs.”

Section 3.6 might benefit from being partitioned into sub-sections, if only to assist referencing. Suggested sections are:

3.6.1 Transmission of time synchronisation request

3.6.2 ADS-B request procedures

3.6.3 Information field priority

3.6.4 TCP/SVQ change procedures

In Section 3.7.1, clarification that DOS parameters should be sent by ground station only seems a useful addition. Also note correction of incorrect reference: “Directory of service information shall be transmitted by a ground station only, using the CTRL DOS parameter defined in Section 1.5.~~4.4.2~~3.6.6.”

Table 1-86 says reserved for future allocation by ICAO but 0, 1, 2 and 3 are already defined in Table 3-23. Add a row to Table 1-86 containing: “0 – 3”, defined in Table 3-23 and change existing first row from “0 – 31” to “4 –31”.

Table 1-87 says reserved for future allocation by ICAO but 0, 1, 2 and 3 are already defined in Table 3-24. 5 – 8 are further reserved in Table 3-24 which does not seem necessary. Add a row to Table 1-87 contianing: “0 – 3”, defined in Table 3-24 and change existing first row from “0 – 31” to “4 –31”. Also delete final row from Table 3-24.

In Section 1.3.14 (Unicast procedures), The note is not correct if sdf=1. Correct the note as follows: “*Note.- This protocol is intended for a VSS user which requires a) a response from a peer VSS user in a reserved slot, b) to reserve a slot for a transmission to a peer, or c) to reserve a slot to make a broadcast transmission. In the case of c) the protocol is a more flexible version of the incremental broadcast protocol, supporting reservations of variable length on user defined channels.*”

In Section 1.4.1.5, clarify the text describing the action of listening to a multicast address as follows: “A VDL Mode 4 station shall accept broadcast DLPDUs, and accept multicast DLPDUs that have been~~to~~ multicast to addresses of stations to which it is listening.”

In Section 1.4.4.5.1, both an INFO field and a unicast reservation field have a priority subfield. It needs to be made explicit how the two priority fields are set. A possible resolution might be that a statement is required which says that the unicast pr field is set to the value of the INFO pr field. Note that table 1-60 already specifies that the two priority fields should be set to the same value. It is therefore recommended that a note is added to help clarify the situation:

> “*Note.- The priority field in the unicast request reservation field is set equal to the priority setting in the INFO DLPDU as specified in Table 1-60*”

In Section 1.4.4.6.1, an INFO_RTS and a CTRL_RTS both have a priority field and in this section they are required to be placed with a unicast reservation field which also has a priority field. See comment 86 for possible resolution.

“*Note.- The priority field in the unicast request reservation field is set equal to the priority setting in the INFO DLPDU as specified in Table 1-61*”.

In Section 1.5.3.5.4, modify the text as follows: “Table 1-80 shall define~~s~~ the ~~values~~ encoding of parameters ~~used~~ for the m2 filter ~~that~~ to be used by a mobile ~~shall use~~. M2inc ~~is~~ shall be encoded as an 8-bit unsigned integer. M2limit ~~is~~ shall be encoded as a 16-bit unsigned integer.”

In Section 1.5.5.1.2, the following editorial correction is made to make requirement apply to a specific mobile (consistent with the rest of TM):

> “Whenever a mobile station~~s~~ ~~are~~ is not directed to transmit synchronization bursts on any frequency, ~~they~~ it shall transmit ~~mobile~~ synchronization bursts at least once per M1 slots on all GSCs on which ~~they~~ it can receive ~~at least once per M1 slots~~. When transmitting autonomously on the GSCs, a mobile station~~s~~ shall use the standard parameters defined in Table 1-66.”

In Tables 1-50 and 1-52, the numbering of the elements in the prm subfield should be changed to prm_1 to prm_k, and it should be indicated that this is a variable length field. It should be made clear that the prm field is optional. It should be said that this field should not be included unless it has been specified by an additional application standard (e.g. TIS-B, FIS-B).

In Section 3.6, there is general inconsistency in the use of the auto bit in the text. Also, when setting the sleep bit to 0, the pos, snr and vel subfields are omitted (see 3.4.2) – this is not the case in the text of 3.6. The reference to time synchronisation is imprecise, out of place and refers to the wrong variable part.

The changes proposed below correct these inconsistencies.

> "A station issuing an ADS-B request (see Section ~~C.4~~3.4) shall set the auto bit to ~~0~~ 1 and include the r-id field when requesting a specific information field. ~~A~~ The requesting station shall set the auto bit to ~~1~~ 0 and not include the r-id field when it desires that the responding unit determine which information field is the most important at any point in time. The requesting station shall set the sleep bit ~~shall be set~~ to 0 when requesting a single response (e.g. via a unicast request reservation)~~; the vel, pos and rate fields shall be included in the transmitted request and ignored by the receiving station when the sleep bit is set to 0~~. ~~A station requesting the time synchronization information field (information field ID 2) shall only transmit a request to a station that has announced that it is operating with a primary time source (tfom = 0 or 1).~~
>
> ~~A~~ The requesting station shall set the sleep bit to 1 and include position and velocity thresholds (see Section 3.4.2) when it wants the responding station to transmit a synchronization burst in directed slots at one rate, but transmit at a higher rate under certain circumstances. ~~If~~ A mobile station in receipt of an ADS-B request in which the sleep bit is set to 1, ~~a station~~ shall monitor its position and velocity to determine if the station has exceeded either of two thresholds: (a) moving more than pos metres from the position reported in the last directed report or (b) moving more than vel knots. If pos is zero, then the position test shall be ignored. If vel is zero, then the velocity test shall be ignored. A station which exceeded either the position or velocity threshold, shall begin to transmit autonomously using the incremental broadcast procedures until one of the following occurs:
>
> ….
>
> A station requesting the UTC time synchronization information field (information field ID 24) shall only transmit a request to a station that has announced that it is operating with a primary time source (tfom = 0 or 1)."

Again in Section 3.6, the requirement starting "Information fields 0, 1, 2, 3, 4....." is not clear. It is assumed that this applies when a station is requested to transmit a whole series of variable part types by the VSS user or through a channel management message. A problem arises because the periodic protocol used for sync bursts cannot fail to find a slot for a transmission – hence the station will transmit whatever the applications tells it to and there is no concept of prioritising one over the other. The concept of priority only seems relevant if, at the application level there is more than one level of service, with one level applying when the link is busy and resulting in a reduced reporting rate. We do not have that at the moment. The following change makes the requirement clearer:

> "When a station is requested to transmit a series of sync bursts with different variable part content, i~~I~~nformation fields 0, 1, 2, 3, 4 and A~~A~~1 hex shall have priority over other information fields."

Note that the above changes should be considered alongside the re-sectioning suggestions presented in the point above.

2.4 Further correction of text

The items described in this section address some areas that require minor correction. This changes were co-ordinated by various members of the subgroup.

2.4.1 Co-Channel Interference

In section 1.3.3.2 (VS2 parameter) some clarification text is added for the correct interpretation of the CCI formula. In Section 1.3.6.2.2.1 clarification is provided to the definition text of CCI protected communications.

2.4.2 Protocol Options Parameter

In section 1.5.7.9 text requires updating to reflect the new protocol options parameter in place of the former AVLC options parameter.

2.4.3 Encoding of new ND4 parameter

The new ND4 parameter (maximum length of UDATA burst) recently added to the DLS system parameter set should be included in table 1-75, which defines the encoding of the DLS system parameters.

2.4.4 Retransmission Procedures

The formula for determining x in Section 1.3.21 has the potential to contain a "divide by zero" when u = 1. To avoid this situation the formula is modified as follows:
x = Q5mult * (Q5exp^retrans) * M1 / ((M1+1) - u),
where u is re-defined as the number of occupied slots within the past minute.

2.5 Presentational and other editorial related corrections

2.5.1 Styling issues

To maintain consistency of style within the body text, instances of "0" are changed to "zero" (similarly for 1,2…) and some instances of special symbols that appeared to be imported incorrectly in the manual are corrected e.g. " " changed to "not equal to".

2.5.2 Clarification of text

In Section 1.3.1.4 (unicast procedures) clarification provided for the text describing the burst structure when the address type field is other than 7.

In Section 1.3.6.4.1 (establishment on ground quarantine), clarification is provided on the quarantine status of slots for a mobile when further than VS4 from a ground station or a directed mobile, AND in the case of directed mobiles, generalising the quarantine status to any transmissions by this mobile not just synch bursts.

In some instances clarity is provided by substituting pronouns with nouns, e.g. section 1.3.16.3.1). "…the destination station shall cancel all previously placed autotune reservations made by the source station on frequency f (see Section 1.3.10.5.9). Otherwise the station shall retain ~~them~~the previous reservations."

In other instances, adding specificity to the text, for example by fully stating the condition instead of "if so, .." makes the text more comprehensible. E.g. in Section 1.3.16.4.5 "A station shall check to determine if a previous plea response had been sent to the mobile making the plea (i.e. the destination ID for this plea response)~~, and if so, it~~. If a previous plea response had been sent to the mobile making the plea, the station shall begin the list of reserved slots…"

In Section 1.4.2.3.6 clarification of the encoding of the DLS burst length subfield is provided as follows: “The length subfield (lg) shall indicate the length of the DLS burst containing a DATA DLPDU in slots. It shall be encoded as one less than the absolute length.”

Some cases of missing text are rectified, e.g. in section 1.4.4.6.4.1: “On receipt of a UDATA_CTS DLPDU in a DLS burst addressed to it with a unicast request reservation field a station shall transmit the requested UDATA DLPDU in the allocated reservation.”.

Some instances were text has been re-located to sections for which they are more appropriate, for example, the requirement placed in the recommendation 1.4.4.12.1 belongs to a level higher in 1.4.4.12.

Removal of some instances of multiple redundant “shalls” from the same sentence (or clause) with the purpose of making each requirement traceable.

Tables 1-71x in Section 1.5 require application of the standard format to contain the header row and octet column.

Updating of acronyms (1.1.3) and the parameters (table 1-1) and symbols (table 1-2) tables.

Corrections to Chapter 4 including updating of section referencing and inclusion of requirements for the encoding/decoding formulae.

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