CCSDS SLS-SLP WG Meeting Minutes
Fall 2023 Meeting (The Hague, the Netherlands)
November 27, 2023
Final Version

1. *Attendees*: Ignacio Aguilar-Sanchez (ESA), Greg Kazz (NASA), Matt Cosby (UKSA), Stefan Veit (DLR), Amanuel Geda (DLR), Gilles Moury (CNES), Johnathan Jackson (NASA), Tom Gannett (NASA), Antonios Tavoularis (ESA), Kanglian Zhao (Nanjing University, China), Christian Stengl (DLR), Jean-Luc Issler (CNES)
2. Number of Atendees based upon Agency: (12 Total)
   China 1
   CNES 2
   DLR 3
   ESA 2
   NASA 3
   UKSA 1

   All the files mentioned in these meeting minutes can be found on the SLP WG CWE under the following URL:
   https://cwe.ccsds.org/sls/docs/Forms/AllItems.aspx?RootFolder=%2Fsls%2Fdocs%2FSLS%2DSLP%2FMeeting%20Materials%2F2023%2FFall&View=%7BAE8FB44C%2DE80A%2D42CF%2D8558%2DFB495ABB675F%7D&

3. *Resolution of the ESA RID to the Space Packet Protocol Version 2.0 Blue book (CCSDS 133.0-B-2) reverting the incrementing of the SPSC for idle packets to optional*

Consensus was reached in the SLP WG regarding the acceptance of this RID from ESA. The RID describes the rationale for why ESA wants to change the Version 2.0 SPP Blue book back to the original requirement in the version 1.0 SPP Blue book. Namily, different on-board processors (H/W and S/W) could be generating SPSCs for idle packets on board, and there is no current mechanism to ensure SPSC continuity in some operating cases by the existing architecture. Therefore, since Agencies in general discard idle packets, it is acceptable to continue to relax the incrementing requirement on idle packets. See also the analysis section of the RID written by Marco Rovati.

In terms of making the actual change to CCSDS 133.0-B-2, the working group will hold onto this change until the 5-year review period is triggered, which will be in 2025.

4. *Disposition of the RIDs to the USLP (CCSDS 732.1-P2.1)*

All 7 RIDs from NASA as well as all 7 RIDs from ESA were successfully resolved at the meeting. The disposition of each RID was recorded on the RID forms and have been loaded onto the CWE under the URL in item 2 above. Please see the folder titled, “USLP Final V3

RIDs". DLR mentioned that the need VCA and VCP services in USLP. NASA also does not use MAPs but they use VCs. Gilles Moury mentioned that VC and MAPs occur at different level of hierarchy, with MAPs a subset of the VC. However, they are often times 2 ways of accomplishing the same task.
The question from Stefan Veit was raised about: "Why does the restriction exist that VCA and VCP services are not allowed in the same VC" ? This is a constraint maintained in the other CCSDS SDLP books. From a practical point of view, there are ample (64 VCIDs and 16 MAP IDs) ID space available in USLP to dedicate a separate VC to either a VCA service or to a VCP service. There was no strong feeling within the SLP WG to remove this restriction which provides some simplification without reducing available programming resources.

ACTION-1-2023-11-06: On Greg Kazz to harmonize USLP Chapter 6.6.2 with TC for MAPs (table 3 and ensure the entire SDLS chapter is current like TC is). Due Date: Dec. 15, 2023

5. Decompose *Prox-1* (CCSDS 211.0-B) into 3 separate books, two of which would be new blue books.

The SLP WG reached consensus on having the secretariat split the Prox-1 Data Link Layer Protocol (CCSDS 211.0-B-6) into 3 separate blue books: 1) A combined COP-1/COP-P BB, 2) Space Link Protocol Session Control Blue book (not specific to Prox-1, but more generic to all the SLP link layer protocols), and 3) Prox-1 Data Link Layer Protocol (similar to the existing TC, TM, AOS SDLP blue books). Major reasons are to allow future users to swap out the Prox-1 Version 3 transfer frame with the USLP Version 4 frame. Also gain more selection in terms of using or not using the COP-P for ARQ. Also so that Prox-1 SDLP conforms more with the other existing SDLPs. Futhermore, allow Lunanet more flexibility in accepting CCSDS link layer specifications. Tom Gannett mentioned that the MIB would need to be divided up amongst these books as well as the other Annexes. Also Tom suggested that for some limited time both versions (the existing 211.0-B and the new books) could be live in parallel, until CCSDS was ready to make the switch to the new documents.

6. Questions for discussion at the joint RF&MOD, C&S, and SLP WG meetings later in the week

    a. LNIS wants to us BPSK but does not define Bi-Phase-L modulation – seems to be inconsistent with the current Prox-1 default session parameters?
    b. Why not add the CCSDS Convolutional r=1/2, k=7 code to the MODCOD table for lunar?
    c. Eb/No and not Es/No should be used in the MODCOD table as a performance parameter ?
    d. Should a sub-carrier be introduced for Lunar proximity operations ?
    e. Why was LDPC rate 4/5 code not defined in the MODCOD table ?
    f. Why is Filtered OQPSK not defined in the MODCOD table ?

Note: Jean Luc Issler mentioned that UHF is planned to be used at the Moon between 410-420 MHz dedicated to Space Research allowed on the "shielded portion of the moon" defined by a 1000 km zone around the moon in a cone centered around the Earth, which is an ITU definition which covers ½ of the moon's surface. Interference with Radio Astronomy is to be avoided.

7. Discussion about edge cases in filling USLP transfer frames with fill (idle) packets

This discussion was brought up towards the end of the SLP WG meeting by Stefan Veit. I am including it in the minutes so that others can take advantage of the full discussion which occurred also over email with the SLP WG on distribution.

4.4.1.2.3.4 When the value in the TFDZ construction rule is '000' binary, and when no packet starts nor ends within the TFDZ, then the FHP shall be set to binary 'all ones'.

We created USLP requirement 4.1.4.2.3.4 to deal with the following issues:

I. When a packet spans multiple transfer frames, we need a way to identify to the user, that the FHP value can't be used to find the start of the packet in that given frame, because the packet doesn't start nor end in that given frame i.e., the frame contains the data portion of a packet.

II. No problem with saying, "when no packet starts within the Transfer Frame Data Zone (TFDZ)", that is similar in logic to AOS SDLP.

III. Now, let's examine the rest of the statement, "nor ends within the TFDZ". This is where USLP goes beyond the logic specified by AOS SDLP. Because, AOS does not deal with the following: This part of the statement was written with the intent of eliminating the cases, in which a packet would end in the TFDZ, but there would be no mechanism available to the user to fill the remainder of the TFDZ, if the amount of fill is less than 7 octets in the case of SPP, or less than 1 octet in the case on EPP. If one uses SPP (Space Packets), then the smallest Space Packet that could be used to fill out the remainder of the TFDZ would be 7 octets (6 octets of Primary Header plus 1 octet of data). This minimum size is the mandatory minimum per the Space Packet Protocol. As far as I know, all CCSDS agencies still exclusively use the Space Packet and do not implement encapsulation packets. Now, if one chooses to use Encapsulation Packets as the fill packet mechanism, then the minimum size is 1 byte per the Encap Packet Protocol (1 byte header only). Also one can use multiples of that 1 byte Encap packet to fill out the remainder of the TFDZ.

IV. Given all of points 1 through 3 for background, let's tackle your specific case, "when a packet started in a previous frame and ends exactly at the end of the current TFDZ, filling it completely". So in this frame no packet starts, so the FHP value does not have a legitimate value, so we use the 'all ones' convention to convey that meaning. That is the correct behaviour for setting the FHP. The fact that the packet ends in that TFDZ means that the user has nothing more to do with this frame, i.e., the user doesn't need to fill the remainder of that TFDZ with anything. I think the confusion is when you state, "since there is no place for another packet". But there is no problem with there being no more space in the TFDZ in this case. The bigger problem that USLP did address that AOS did NOT address, is when there is a small remainder left

in the data field of a frame that the user cannot fill, so the transfer frame maker on-board the spacecraft, has to avoid the nasty edge cases of less than 7 octets remaining when space packets are used (encap packet is much more flexible, but as I mentioned, I don't think any agency has implemented them yet !)

Current thinking is to add this material as guidance to the USLP Green Book.

8. Two resolutions were requested as a result this meeting:

8-1. SLP WG requests that the CCSDS approve for publication the new USLP document (CCSDS 732.1-B-3) once the approved RIDs are encorporated into the pink sheets.

8-2. SLP WG requests that the CCSDS reorganize the existing CCSDS 211.0-B-6 (Prox-1 Data Link Layer Protocol) into 3 separate blue books: a) Proximity-1 Space Data Link Protocol, b) COP-1/COP-P combined blue book, c) CCSDS Space Data Link Session Control.

9. Next planned meeting– the Spring 2024 technical meetings are to be hosted by USA NIST and scheduled to be held in Downtown Washington D.C. at the Department of Commerce Building from April 29 to May 3, 2024. Please see https://public.ccsds.org/meetings/default.aspx for more details as they appear. Nearest airport is Reagan International.
The expectation is that the Fall 2024 meetings will be held in the UK, hosted by UKSA. Location is TBD.

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