CCSDS SLS-SLP WG Meeting Minutes

Fall 2024 Meeting Chiswick (London), UK

Nov. 5, 2024

Draft Version

1. *Attendees*: Ignacio Aguilar-Sanchez (ESA), Greg Kazz (NASA), Matt Cosby (UKSA), Gilles Moury (CNES), Clement Leclerc (CNES), Ken Andrews (NASA-JPL), Saverio Santini (ASI), Benjamin Schwarz (SSTL), Mazen Shihabi (NASA-JPL), Peter Shames (NASA-JPL), Stefano Petri (ESA), James Lux (NASA-JPL)
2. Number of Atendees based upon Agency: (12 Total)

2, CNES 2, ESA 5, NASA 1, UKSA 1, ASI 1, Industry

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%2F2024%2FFall%2FSLP%20WG%20Meeting%20Minutes&FolderCTID=0x012000439B56FF51847E41B5728F9730D7B55F&View=%7BAE8FB44C%2DE80A%2D42CF%2D8558%2DFB495ABB675F%7D>

1. S-band Proximity Links for Lunar Operations

N.B. Proximity Links is the generic term for all space links in the vicinity of the moon as opposed to Proximity-1 which is the specific use of the Prox-1 protocol.

The decision was taken in the SLS Plenary on Friday Nov. 8 to first divide the existing 211.0-B-6 (Prox-1 SDLP) into 3 separate books (COP-P, Generic Link Layer Session Control, Traditional Looking Space Data Link Layer Protocol, called Prox-1 SDLP). The two normative annexes that the SLP WG concluded its work upon i.e., Default Session Parameters and the Set of Directives will be transferred into the Space Communications Session Control White Book, CCSDS 235.1-W.

Rationale for doing the work in this order was to facilitate the adoption of these CCSDS standards by Lunanet and future adopters. This approach will give the user community greater flexibility (e.g., Generic Session Layer) over a specific Prox-1 configuration.

In order to publish these 3 data link layer books along with the updated RF&MOD Prox-1 (211.1) and C&S Prox-1 (211.2) books (total of 5 blue books), a target date of Feb 1, 2025 has been set at the SLS area plenary.

ACTION L-1: Matt Cosby/Mazen Shihabi to receive the actual format to be used by SSTL/VW of the SPDU Type 4 directives in order to document them in an annex in the 235.1-W (session control book). Due date is Nov. 30, 2024.

Specific Points on SPDU Type 5 directives taken during this topic at the SLP WG meeting were:

* Stefano Petri mentioned that the Symbol Rate text lacked clarification in how the actual conversion to/from the 16 bit number is to be performed. A reformulation of the text resulted in the following:

To derive the value of this field, the symbol rate in symbols per second shall be divided by 2^16 and then converted to IEEE 754 half-precision floating point.

* + To derive the symbol rate value from the field value, the opposite operation shall be done, i.e. the floating point value shall be multiplied by 2^16.
* Greg Kazz added the 2-bit Transceiver Mode Field to SPDU Type 5 Set Link Establishment & Control directive in order to indentify the space data link layer protocol. The values are: Prox-1, USLP, AOS, CCSDS Reserved Spare.
* In the SLS joint meeting, the “Bi-Phase-L” Modulation value was changed to “PCM/PM/Bi-phase-L (filtered);
* In the SLS joint meeting, the initial modulation index value was changed to “carrier only” i.e., 0 rad/pk (No Modulation);
* In the SLS joint meeting, the instantaneous link SNR description was changed to: Bits 32-39 of the LINK ESTABLISHMENT & CONTROL directive shall contain the link Signal-to-Noise (SNR) ratio Es/N0 in dB. Valid values range from -31.75 to 31.75 in quarter dB steps. A value of -32 indicates that the value is unavailable or invalid. This value is a signed fixed point number.

The following are notes given to us by Tom Gannett that I am duplicating below because they have relevance to dividing the Prox-1 SDLP BB (211.0-B) and it’s impact on some of the SLP WG related blue books.

*[Tom Gannett] Specifically, I would create a new section in the Session book, Section 3, Protocol Data Units; move 4.2.1, COMMUNICATIONS LINK CONTROL WORD from TC SDLP to subsection 3.1 in the Session book; and move 3.2.4, SUPERVISORY PDU from Proximity-1 to subsection 3.2 in the Session book:*

*1              INTRODUCTION*

*2              OVERVIEW*

*3              PROTOCOL DATA UNITS*

*3.1          COMMUNICATIONS LINK CONTROL WORD*

*3.2          SUPERVISORY PROTOCOL DATA UNIT*

*4              DATA SERVICES OPERATIONS*

*4.1          STATE TABLES*

*ETC.*

*I believe this is a clean approach that would make COP services and session control available without the need to invoke the PDU format specifications in TC SDLP and Proximity-1, but I have not looked at all potential ramifications in all Data Link Layer specs. . . .*

*All the cross references to CLCW/PLCW/SPDU in the source books would be changed to direct references to the Session book; current references in the COPs to CLCW/PLCW/SPDU in the source SDLP books would be changed to references to the Session book. Service definitions will eventually need to be added to the Session book.*

*TC SLDP would have to be pink sheeted, and any books currently referencing TC SDLP for COP-related stuff would need to updated (via corrigendum probably).*

[Greg] This approach that Tom is advocating would solve several problems. TC SDLP should not have the CLCW defined in it, since the TC Frame is the only PDU of that document. Similarly, the PLCW of Prox-1 and the SPDUs in Prox-1 should move to the Session book.

1. AOS 4.1 and 4.2 Pink Sheets

At the SLP Plenary, the decision was taken to advance AOS SDLP to Version 5 which will include both the 4.1 (16 bit FHP, FHEC corrections) and 4.2 (V2 SCID augmentation) Issue pink sheets.

Consensus was achieved on USLP to be the long term solution to the insufficient number of SCIDs in general, since it provides a 16 bit SCID in the USLP transfer frame header.

Consensus was also achieved in accepting the AOS Pink Sheets 4.2 (4.1 was previously resolved and accepted) and resolving the ESA RIDs.

During the ESA RID discussion, instead of creating a new SCID Extension Field, the MCID first needed to be sorted. MCID is now (Issue 5 and higher) a 12 bits. SCID is now a 10 bit field. So it became clear that a SCID extension field is unnecessary. For Issue 4 and previous, those fields are 10 bits and 8 bits respectively. Jim Lux created a draft Figure 4-2 figure that shows how the existing 8 bit SCID field is combined with the 2-bit spare field to create the composite 10-bit SCID.

ACTION L-2: Greg Kazz to check with the SLE (Erik Barkley) to ensure the 10 bit SCID and 12-bit MCID doesn’t have any negative effects on the SLE protocols. Due by Nov. 30, 2024.

ACTION L-3: Greg Kazz to inform SANA of the change to the SCID registry for V2 (AOS) SCID and change the AOS MCID registry.

ACTION L-4: Greg Kazz to update the SCID and MCID tables in the associated greenbooks i.e., CCSDS 130.0-G-4 (OSCP GB) and CCSDS 130.2-B-3 (Space Protocols GB) along with adding reference material in that GB about USLP.

Gilles Moury provided a INMARSAT Spacecraft example of a SCID collision in orbit utilizing at the time the ESA PCM TC Standard (previous to CCSDS TC SDLP). This collision occurred between spacecraft using the same SCID (not uncommon for LEO spacecraft) and the same modulation and channel coding.. The flight spacecraft executed commands which were not intended for it. This example illustrates the danger involved in sharing the same spacecraft ID amongst multiple spacecraft given that many of them also use several common physical and channel coding characteristics.

In addition, the CCSDS at the CESG and CMC are encouraged to continue to press member agencies to release no longer used SCIDs. Note also that the UKSA demonstrated in their study of about 10% of the assigned Version 2 SCIDs that multiple collisons (short overlap seen by the tracking station of 2 spacecraft near the poles) are a common occurrence, and no agencies are reporting any operational problems. Nevertheless, SLP WG concluded that it would be a labor intensive move to make SANA change its procedures to utilize even more physical layer descriminators (such as modulation or frame length) which also might end up being shared amongst common spacecraft.

1. Necessary updates to the Prox-1 GB (210.0-G)

Once all of the updates to the 3 split proximity space data link layer books are ready to go to agency review, then the Prox-1 GB can begin to be modified.

1. 5 year CCSDS review of the documents under the SLP WG purview

At the Spring 2024 meeting, the SLP WG came to consensus on making the Next Generation Uplink Green Book (CCSDS 230.2-B-1) a Silver document, which retires the document, but still allows one to view it on the CCSDS website. A formal resolution will be submitted by the SLS AD to the CESG to do so.

In addition, the Telecommand GB (CCSDS 200.0-G-6) and also the AOS GB – 700.0-G-3 (1992) have been reviewed by a subset (Ken Andrews, Brent Andres, Matt Cosby, Greg Kazz) of the SLP WG. Consensus was achieved at this meeting to retire both of those green books and transfer any useful coding & synchronization info found in them to the Coding and Sync green books.

ACTION L-5: Ken Andrews will save unique and useful portions of the Telecommand GB that don’t already exist in the TC Sync & CC GB (230.1-G) as well as any applicable sections in the AOS GB – 700.0-G-3 to the TM Sync & CC GB (130.1-G).

ACTION L-6: Matt Cosby and Brent Andres to review COP-1 (232.1-B), last published in 2010 to ensure there are no updates needed due to the 5-year review.

ACTION L-7: Greg Kazz to review the CCSDS Spacecraft Identification Field Code Assignment Control Procedures, 320.0-M to see if any updates would be required due to the AOS V2 and MCID changes to 10 and 12 bits respectively.

1. The following resolutions were requested as a result this meeting to the SLS AD:
2. SLP WG requests that the CESG approve for publication the Silver Version of the Next Generation Uplink Green Book (currently, CCSDS 230.2-G-1) and therefore retire the existing green book version.
3. SLP WG requests that the CESG approve for publication the Silver Version of the AOS GB (currently, CCSDS 700.0-G-3) and therefore retire the existing green book version.
4. SLP WG requests that the CESG approve for publication the Silver Version of the Telecommand GB (currently, CCSDS 200.0-G-6) and therefore retire the existing green book version.
5. Incorporate CCSDS 732.0-P4.1 and P4.2 AOS pink sheets into Issue 5 AOS Blue Book
6. Advance these 3 books to Agency Review before the Spring 2025 meeting: COP-P (New document number), Space Link Protocol Session Control (CCSDS 235.1-W), Prox-1 Space Data Link Protocol (reformulated).
7. Next planned meeting– the Spring 2025 technical meetings are to be hosted by NASA and most likely will be held at the Applied Physics Lab (APL), in Laurel ,Maryland, USA situated between Baltimore and Washington, DC, near the I-95 motorway scheduled from May 5 to May 9, 2025 but these dates may change somewhat. Please see <https://public.ccsds.org/meetings/default.aspx> for more details as they appear. The Fall 2025 meetings are planned to take place at the University of Hamburg, from Sept. 15 to 19, 2025.
8. Acknowledgment

The SLP WG really appreciated the absolutely lovely accomodations and hospitality granted to us by the UKSA at these meetings.

END